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Electrical World
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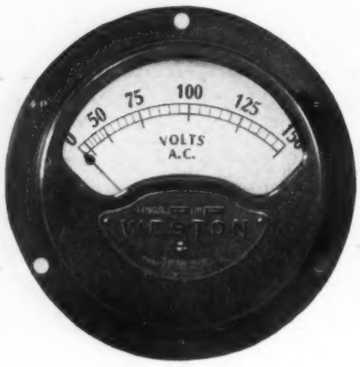

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Electrical World

New York, Saturday, October 15, 1921

A Public Servant to All Classes of Electrical Men

NO MAN can live for himself alone, neither can any business. The inter-relationships of society automatically influence each person in everything he is and does, even to limiting his liberty in order to preserve the liberty of others. Just so, every business institution becomes an element in the industry of which it is a part and cannot think of or for itself without regarding others.

The manufacturing enterprise, the jobbers' organization, the central-station company, the contractor-dealer—each is engaged and engrossed in an independent business; yet in every case there is this interdependence upon and responsibility to the other manufacturers, the other jobbers, the other central-station men, the other contractors and dealers that morally restricts them. As members of one industry they are all embraced by a general application of the golden rule. And each manufacturer or central-station company, each unit in this industry, cannot in fairness be looked upon entirely as a selfish business conducted for its own benefit. For each unit is also a working element in an industry in which its influence and value can be measured.

The ELECTRICAL WORLD is a national institution. As a business enterprise in which much money is invested, it must be operated to earn a profit. But since its entire function consists of providing an essential service to electrical men of every class, its impersonal aspect as an institution in the electrical industry far outweighs in importance its embodiment as a business. It is a vehicle that carries business and engineering ideas and ideals and other necessary information of the industry to electrical men the world around and affords a means whereby the manufacturers may lay their messages before the builders of the industry and those who must maintain and operate its machinery. Every division and individual unit of the electrical community of interests is therefore directly concerned with the ELECTRICAL WORLD and affected by the success with which it does its work and the degree to which it serves. As a utility rendering a public service within our industry, it is made and owned, not by its stockholders or its editors, but by its readers and its advertisers.

Electrical men have been a bit class-conscious. They have thought too much as manufacturers, as jobbers, as central-station men or contractor-dealers. It is a natural, common failing. But it has delayed their progress and impeded their prosperity. It is a weakness and a failing that must be combated and controlled, and there is but one way to do this—which is by broader thinking, broader reading, broader study of our industry and its affairs by all of us.

Ralph Wainwright Pope

Honorary secretary of the A. I. E. E., to whose constructive efforts during more than a quarter of a century as secretary may be attributed much of the present financial and numerical strength of the organization.

THIS week the board of directors of the American Institute of Electrical Engineers is meeting to consider among other things the detailed recommendations for putting into practice the plan for holding as sectional meetings what formerly were monthly national meetings. It seems fitting, therefore, to recall the efforts of Ralph W. Pope to build up and strengthen the section idea for the Institute. Mr. Pope resigned as secretary of the Institute in 1911, soon after being elected to that position for the twenty-seventh consecutive time, and was made honorary secretary for life.

As early as 1893 Mr. Pope pointed out in a paper before the Institute the necessity for establishing sections. In the spring of the following year the first Chicago local meeting was held. The question of local meetings, however, languished until 1902, when under the administration of President Charles F. Scott it became a well-recognized policy of the Institute. Because of his keen personal interest in local activity Mr. Pope lent all the assistance he could to its development, with the result that the section idea has been built up on a firm and strong foundation.

Born Aug. 16, 1844, at Great Barrington, Mass., he developed at an early age a taste for mechanics. At the age of fifteen he worked for the Housatonic Railroad. When the Civil War broke out he entered the service of the American Telegraph Company and became an expert telegrapher. In 1865 he joined the Collins Overland Telegraph Expedition. This famous band of pioneers went into the wilds of British Columbia in an effort to establish an overland telegraph system with Europe by way of Alaska and Siberia. The building of this line was prevented, however, by the success of the Atlantic cable. From 1867 to 1872 Mr. Pope was with the Bankers & Brokers' Telegraph Company. He then became an inspector with the Gold & Stock Telegraph Company and in 1880 was advanced to be deputy superintendent, at the time when the company's apparatus was considered by many as representing the highest development which had so far been reached in the art. In 1882 he became manager of the Union Electric Manufacturing Company. Two years later he was associate editor of the *Electrician and Electrical Engineer*. He had previously had journalistic experience as assistant editor of the *Telegrapher*.

The A. I. E. E. was formed in 1884, and in the following year Mr. Pope was elected secretary. Commencing in 1888, when the first independent office of the Institute was established at 5 Beekman Street, New York, he devoted his full time to this work. In addition to his Institute activities he founded in 1890 the monthly periodical *Electric Power* and in 1891 became editor for electrical terms of the "Standard Dictionary." He was a member of the committee of judges for the department of electricity at the Columbia Exposition held in Chicago in 1893.

Mr. Pope gave to the Institute more than a quarter of a century of service. He studied other and similar organizations to find out ways to improve and advance Institute activities. He believed that the affairs of the Institute should be conducted on business principles, and his insistence on this throughout his tenure of office has been reflected in the organization's strong financial position. That he worked well and in the right direction is attested by its vigorous growth. Upon retirement Mr. Pope took with him in the form of testimonials many evidences of appreciation of the Institute for his constructive work.

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The Testimony of Insurance Companies on Utility Bonds

THE life insurance companies of the country are doing a true and laudable service to the community and to public utilities in advertising, as the Prudential Insurance Company of America recently did, that part of their money is invested in the securities of electric light and power companies. Indorsement of the safety and stability of public utility securities from such quarters is doubly welcome. Moreover, it reveals a keen appreciation on the part of insurance men of their obligation to use the funds intrusted to them for the greatest good. What though crusaders of the Untermyer type rail at them for not putting out more of their money in real estate bonds and mortgages, the difficulty with building is not a disinclination to build or to loan money, but rather the high prices of material and labor and the loss which must inevitably follow any shrinkage of inflated real estate values. One million invested in the securities of electric light and power companies makes electric service available for hundreds of thousands, while the same amount of money put out in mortgages would benefit a very few or at most a few hundred. Surely the policy holders of the Prudential ought to feel with Pope: "He serves me most who serves his country best."

Good Public Relations Are Like Good Health

SO MUCH is being said nowadays about public relations that it would almost seem that good public relations are something only to be achieved by the most painstaking effort. As a matter of fact, good public relations for a utility company are like good health for the individual, simply the normal, natural condition that follows right living and right conduct. Discontented men who are seeking health are often those who have squandered it in careless living and bad habits and then realized their loss; and the central-station company whose public relations are unhappy is simply suffering from past indiscretions that have bred popular misunderstanding and dislike until at last it has come to see how priceless a possession has been thrown away.

Well men do not worry about their health, though they are proud of it and guard it sensibly. Neither do popular and respected utilities have cause to fear concerning their public relations, though they must jealously protect themselves against the hasty acts of thoughtless employees who may misrepresent them and cause them to be misunderstood. We must remember that health, not sickness, is normal, and that to be thought well of is normal too. But the laws of health and the laws of living cannot be disregarded with safety.

A little care, a little thought, however, and a man keeps well and a utility enjoys the full respect and confidence of the community.

Help the Railroads Solve Their Terminal Problems

NO ONE giving thought to the matter can escape the conclusion that the railroads of the country are in a bad way. A malignant palsy has affected almost all of them, and the diagnosticians as well as the patients are naturally puzzled and worried that the roads do not respond to treatment. The latest cure proposed is a grouping of the chief railroads into nineteen systems. Although greater centralization and concentration will effect economies, we doubt if they will be sufficient to ward off the inevitable. Palliative after palliative has been applied time and again, but the last state of the railroads seems to be worse than the first. For this condition the bankers have been blamed by some, management has been called incompetent by others and labor inefficient by nearly all. Crimination and recrimination, however, are of little avail. If the railroads are to be saved, a more general and keen appreciation of the seriousness of the transportation problem and the urgency of its solution is needed. It must be recognized at the outset that, the motor truck notwithstanding, there is nothing so economical for carrying freight and passengers as a train of cars running on a track. Nor is there any danger in the long run of the uneconomic superseding the fundamentally economic in the transportation field. Obviously, then, we must take the railroads as they are and apply to them modern engineering methods. But the experience and knowledge of railroad men themselves are necessary, and no solution will be forthcoming until they are convinced that plans proposed are practicable and efficacious.

In point of importance no railroad problem transcends the question of terminals, and it is in the redesign and equipment of terminals to handle freight expeditiously that the electrical engineer can be of most help. The problem is national in scope and worthy the combined efforts of engineers and railroad men. The largeness of the task is obvious when one considers that there are between 250,000 and 300,000 railroad terminals in the country handling material weighing hundreds of millions of tons. Observation and test show that it takes twenty-three minutes to handle a ton of freight from car to platform by means of hand trucks and that with a four-wheeled truck the time ranges from sixteen to seventeen minutes. By means of tractors and trailers the time may be reduced to half, but by the proper application of electricity a ton can be handled in less than a minute. Such records have been made at marine terminals and duplication ought to be possible at railroad terminals. Speed is

the all-important consideration in handling freight at terminals, and electricity is synonymous with speed. If, therefore, the railroads are once more to fulfill their proper functions and render good service at reasonable rates, they must master this problem of terminal congestion. Electrical engineers owe it to themselves, to the railroads and to the country to apply their skill to this problem and do all within their power to assist the railroads in its solution.

Is the Horse Doomed to Extinction?

THE analysis of the commercial electric truck situation in New York City published elsewhere in this issue with diagrams raises inevitably in the mind of the reader the question whether the horse is not ultimately doomed to follow the dodo into the realms of ancient history. From 1917 to 1919 the draft horse in Manhattan and the Bronx diminished in numbers by something like 30 per cent, and motor trucks, electric and other, increased enough not only to take care of the diminished horse traction but also to make up for the natural traffic increase of these years as well. So far as pleasure vehicles are concerned in and about the metropolis, one might almost say that the horse is extinct. There fell under our eyes on Fifth Avenue a few weeks ago the spectacle of a pair of sleek and well-fed horses drawing some wheeled vehicle of ancient design, a "victoria" we believe, and we hear that others have, in the same locality, had a similar experience. We would almost as soon have expected to meet a cave man riding a brontosaurus.

Looking at the matter in all seriousness, the indications are that for commercial trucking purposes the horse is rapidly disappearing—almost as rapidly as from the field of pleasure driving. He is more costly and less efficient than the truck, gasoline or electric, and from sheer economic pressure is bound to go. Whether he will still drag out a toilful existence in the country in face of the competition of tractors is another question. Expelled from the city, he may go back to the farm to find his occupation gone and his old stable converted into a garage for the cars of yesteryear.

Improvement in Central-Station Operating Conditions

THE notes and tables regarding the operating ratio of electric utilities which were published in the Oct. 8 issue of the ELECTRICAL WORLD show in the most forcible manner the skill and energy which have been put into the betterment of operating conditions. The operating ratio, in the sense in which we use the phrase—that is, the ratio between operating and maintenance expenses and gross revenue—gives a rather accurate measure of the financial success of plant operation. It defines the proportion of revenue available for meeting fixed charges and dividends. Of course, the conditions as between steam plants and hydro-electric plants vary radically. In the case of the latter the fixed charges are often relatively very high and a much lower operating ratio must be maintained than in the case of many of the steam-driven plants, where the investment charges are lighter but the operating charges relatively much greater. The necessary variations in operating ratio are considerable on account of fluctuations in cost of fuel and of labor.

In a rough way the operating ratio averaged a little better during the first half of this year than in the preceding year, so far as steam plants were concerned. Nearly 56 per cent is a fair average estimate for the operating ratio where no hydro-electric power is available. In the hydro-electric plants the operating ratio for the last two years was in the general neighborhood of 24 per cent, showing a slight decrease in the current year. This decrease, however, is perhaps not altogether associated with a genuine decrease in costs, since in the low-water season of the middle of the year a good many steam auxiliaries found large use, especially in small plants, and many of these therefore appear in our tables as mixed plants, having both hydro-electric and steam units Thus there were left mainly the larger hydro-electric plants from which good results were to be anticipated. The main point of the matter is, however, that it is plainly evident that the sales of electric supply plants are steadily going up while various economies have tended to lessen the costs of output. It is a remarkable and highly satisfactory condition to find the sales of energy holding their own during a period of conspicuous industrial depression. Nothing shows more plainly how important to the public the supply of electricity has become and how far manufacturing operations must necessarily depend upon it.

The Revised Code of Lighting

THE report of the committee on lighting legislation presented week before last at the convention of the Illuminating Engineering Society is not greatly different from the original code as regards mandatory rules, but contains a valuable mass of explanatory and suggestive matter which facilitates the interpretation and carrying out of the rules. Stated in simple terms, the changes in the rules themselves as regards intensity of lighting were in substance an increase in the lighting of spaces like halls and stairways to 0.5 foot-candle minimum and a recognition of the fact that there are certain classes of work which cannot fairly be classified as real manufacture, though they require the handling of material in the rough, and which do not actually need the illumination of 1 foot-candle previously assigned to them. Such crude operations are in the new rules relegated to the 0.5-foot-candle classification, which, like the raising of hallway and exit lighting to the same figure, is doubtless a wise change. It seems to be pretty well established that hallways and stairways are a fruitful field for accidents and need more lighting than has previously been set aside for them.

The revised rules contain a more complete recognition of the evils of glare than in the original draft, and in particular they state flatly that the use of bare light sources is presumptive evidence of glare. All the required planes of illumination really reach minima far below those which experience has shown to be desirable from the standpoint of efficiency. The mandatory part of the regulations is obviously intended for the benefit of the pinch-penny employer who is willing to take any sort of chances with his workers rather than lay out a cent for improved conditions. Well-informed manufacturers who understand what illumination means to their output can find little excuse for adverse comment on the minima of this code, but may offer some constructive criticisms on the lowness of the figures.

In the second part of the code, which is explanatory of the whole situation, a very valuable mass of information has been accumulated regarding desirable intensities for various manufacturing operations and also, in particular, regarding the conditions which produce glare and their classification. Of course, it is well known that glare involves not only the intrinsic brilliancy of the source but its absolute intensity and its position with reference to the eye of the worker. It is the entrance of these complex factors into the problem that has made glare conditions so hard to define in the past. Even the best attempts at codification have usually dealt specifically with only one of the important phases of the matter, others being met by regulations directed to a general average. The present code contains tables taking all these matters into account and so relating them that by cross-reference an inspector can determine directly whether a source before him should be for the purposes of its use regarded as glaring. The tables look complex, but in reality they are in use quite straightforward, merely requiring passage from one table to another to take account of the several things which cannot be all expressed in one table or in a simple graph. This part of the report is enriched by some effective illustrations, and we believe that it will be found of great use to engineers as well as to the inspectors for whose particular benefit it is put on record.

Electric Leader Cables Aid Navigation

RECENTLY several announcements have appeared both in this country and abroad regarding experiments with "leader cables" and thermionic vacuum tubes for guiding ships into harbors. These accounts indicate an ultimately successful development. A number of patents were issued fifteen or twenty years ago, and among them were two to Dr. R. B. Owens, now secretary of the Franklin Institute. Extensive experiments were carried out under the Owens patents, but without success, owing to the weakness of the signals received on board ship. One of the most recent published accounts of successful application of the principle is that of J. J. Bennett in the *Electrician* (London). The generally accepted plan appears to be a single cable connected at one end to an alternator and of which the other end, after leading through the channel, is connected to a ground plate, the current thus returning to the source of supply by means of the water and the earth. It is stated that such cables have been used up to lengths of 40 miles and in water as deep as 180 feet. The power used in the experiments now mentioned is 9 amp., 220 volts and 500 cycles per second. Unfortunately the published accounts are very meager as regards the results of actual experiments with the equipment. It is asserted that signals may be received up to distances between 400 yards and 600 yards, but little or nothing is said as to actual experience in the piloting of ships through channels, say on a dark night or foggy day.

It appears that the most serious difficulty so far encountered with these methods is the uncertainty as to the distribution of the magnetic field around the cable. If the field were perfectly circular, like that around an indefinitely long conductor, the problem would be simple and the exact position of the cable with reference to a ship could be determined very closely. However, two factors upset this ideal symmetrical field, one being the uncertain return circuit made up of the earth and the water, and the other the screening effect on the detecting coils caused by the mass of the ship itself. These two factors have so far made it impossible to form correct conclusions from the magnitude of the signals received as to the exact location of the cable. It seems probable that further experiment will give more definite knowledge on each of these influences since the field of any one cable should remain fixed and it should be possible to plot it.

Future experimentation, therefore, should take the direction of actually laying out the distribution of magnetic field around "leader cables" and a study of the influence of the metal of the ship on detecting coil when placed in these fields. It appears safe to predict that within a short time we may find a very general application of this device in the problems of navigation offered by dark nights, fogs and uncharted channels.

Industrial Equipment Should Be Tuned to Higher Economic Key

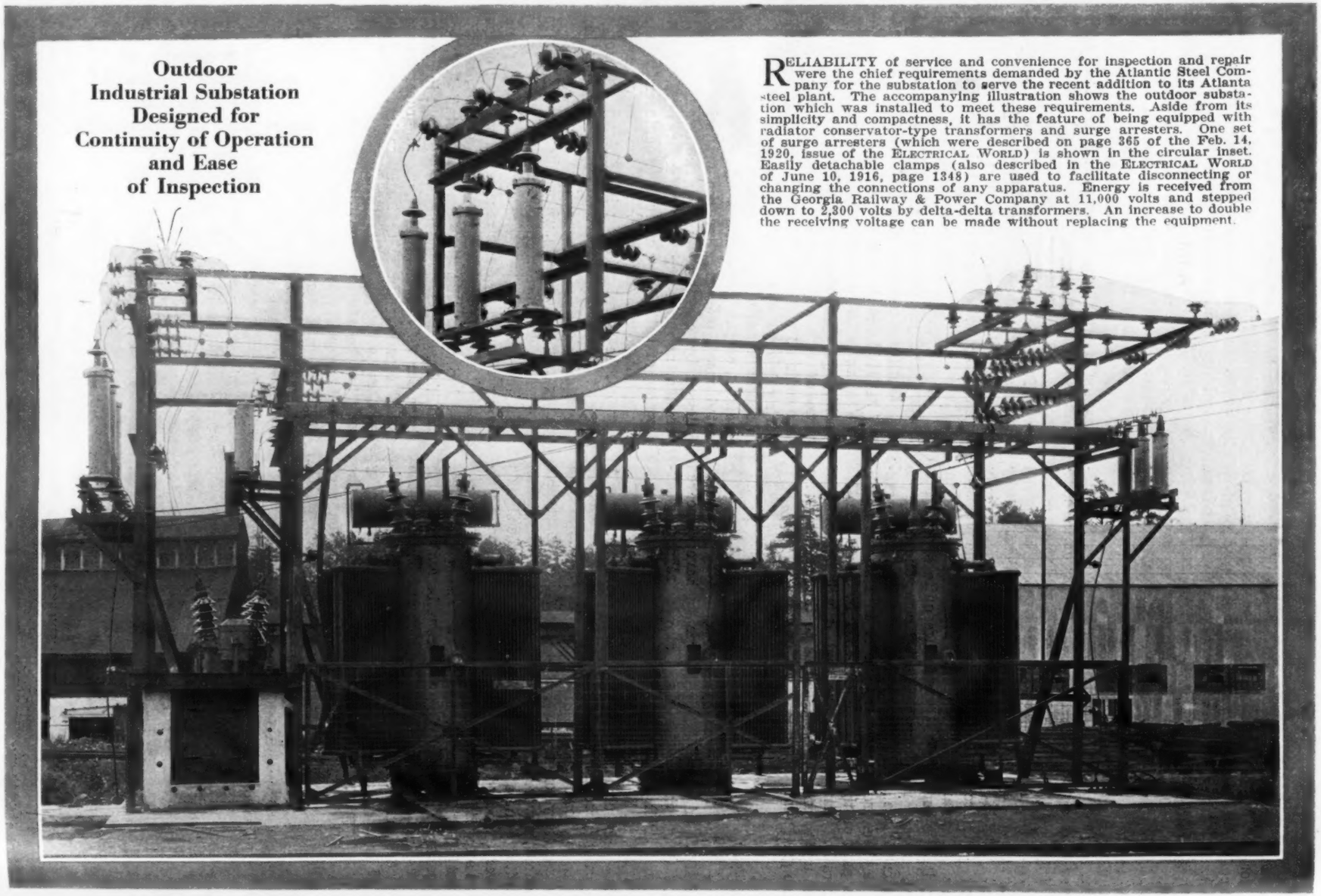
WITH the revival of business increased pressure is sure to be brought to bear by plant owners upon machinery and apparatus to yield service upon a new plane of efficiency. Under stress of war conditions thousands of motor applications, lighting installations, wiring layouts and electric heating devices were put into service with little regard for anything but immediate output capabilities. Accelerated production lasted many months after the armistice was signed, followed by curtailments and shutdowns as the depression now passing hit different industries. The dawning of better days warns the engineer to tune his equipment to a higher economic key, in order that it may not be found wanting in efficiency as prosperity returns.

Visits to industrial plants since the war show a surprising number of cases where the owners apparently have put a stop order on investigations into the suitability of equipment. The need of husbanding resources has varied widely. Some concerns have been obliged to reduce their engineering personnel sharply, and it has been intimated that the remaining staff has had all it could handle to keep the plant equipment in reasonable shape for service at low outputs in proportion to installed capacity. In other instances large war profits have been set aside and still the conduct of betterment work has been discouraged if not actively forbidden. A drifting policy has prevailed in too many establishments where a very modest outlay for surveys, tests and so forth would yield remarkable returns in the approaching days of good business. In many plants today incomplete records of equipment exist. Overcapacity in motor applications remains, with its actual or potential waste of energy and its continuing toll upon fixed charges. Technical organizations are loosely formed or poorly considered with regard to future possibilities. Testing equipment is scanty and in dubious condition and lighting applications are of a temporary order.

Much needs to be done before these plants can measure up to the new standards of service which will be demanded under the competitive conditions of the post-reconstruction era. The material is available for the presentation of a strong case to the executive superiors of the plant engineer, and fortunately a large part of the necessary survey work can be done at moderate cost.

Outdoor Industrial Substation Designed for Continuity of Operation and Ease of Inspection

RELIABILITY of service and convenience for inspection and repair were the chief requirements demanded by the Atlantic Steel Company for the substation to serve the recent addition to its Atlanta steel plant. The accompanying illustration shows the outdoor substation which was installed to meet these requirements. Aside from its simplicity and compactness, it has the feature of being equipped with radiator conservator-type transformers and surge arresters. One set of surge arresters (which were described on page 365 of the Feb. 14, 1920, issue of the ELECTRICAL WORLD) is shown in the circular inset. Easily detachable clamps (also described in the ELECTRICAL WORLD of June 10, 1916, page 1348) are used to facilitate disconnecting or changing the connections of any apparatus. Energy is received from the Georgia Railway & Power Company at 11,000 volts and stepped down to 2,300 volts by delta-delta transformers. An increase to double the receiving voltage can be made without replacing the equipment.



Better Illumination Cuts Production Costs

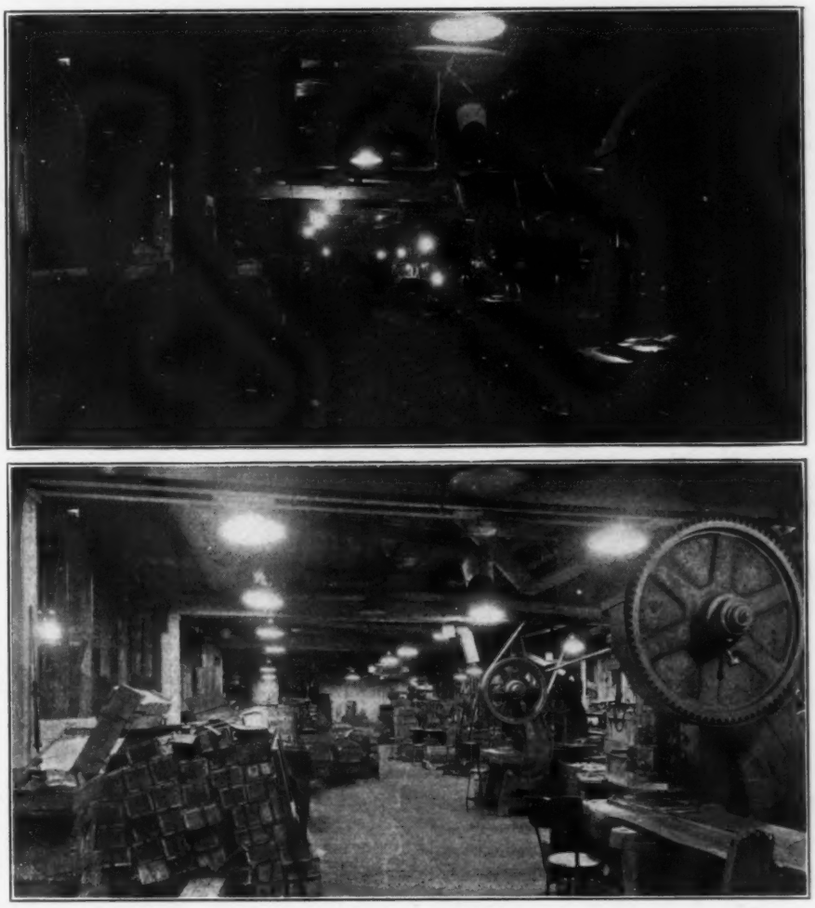
Test Data Show an Increase in Production of 12.2 per Cent Due to the Installation of a Modern Lighting System—Increase in Lighting Expenditure Only 2½ per Cent of Annual Payroll

By WARD HARRISON, ORVILLE F. HAAS and FRED W. DOPKE
National Lamp Works of General Electric Company

SO MANY industrial plant managers have to be shown the dollars and cents value of improved illumination that the following information, based on tests made by the Dover Manufacturing Company, Dover, Ohio, should be helpful to an industrial plant engineer in inducing his manager to rehabilitate his lighting equipment. In the test it was found that the production could be increased 12.2 per cent, with an increase in lighting expense equal to approximately 2.5 per cent of the annual payroll.

The Dover Manufacturing Company makes an extensive assortment of electric, gas and ordinary sadirons for home and laundry use. The press department, where the investigation was conducted, is a rectangular area, approximately 29 ft. x 112 ft. (8.7 m. x 33.6 m.) in area, and is equipped with five punch presses, two milling machines, eight drill presses, one tapping machine and with one tool grinder.

The chief operations performed on the punch presses consist of blanking, forming, shearing, reforming and punching hoods for the irons, while the work performed on the drill presses consists of drilling and tapping the iron castings. The milling operations consist of surfacing the bottoms of the irons. At the time the investigation was begun the personnel of the department consisted of fourteen men, a foreman, ten machine operators and three helpers. The press department has no skylight and is partitioned off from other parts of the plant in such a manner that there are no windows having an outside exposure even on a court, and therefore virtually no daylight reaches the department, the average daylight illumination at noon on a sunny day being less than 0.1 foot-candle. The original lighting system consisted of thirty-two outlets, twenty-two of which were equipped with 50-watt lamps used for local lighting, one with a 100-watt lamp also for local lighting, and nine with 100-watt lamps for general illumination, only two of the latter, however, being equipped with reflectors. The lamps for local lighting were fitted with wire guards and in a few cases also with home-made tin glare shields. The average illumination on the working plane throughout the room was about 0.7 foot-candle, and the illumination supplied at the tool points varied between 0.3 and 12 foot-candles, the average being about 4 foot-candles.



FIGS. 1 AND 2—THE OLD AND THE IMPROVED LIGHTING
Total production under the new lighting was increased 12.2 per cent, by an increase in lighting cost equal to only 2½ per cent of the payroll.

As originally planned, the investigation called for a comparative test with the old system and with a general overhead lighting system consisting of twenty-seven "RLM" standard-dome reflectors and bowl-enameled lamps. It was also planned to vary the levels of illumination with the new system, noting the production under each level and checking back at intervals to the old system. However, a partial shutdown of the plant very much curtailed the scope of the investigation, and this latter idea was reluctantly abandoned. The data secured, therefore, simply indicate an answer to the first question, namely, the comparison of production under the old or original system with the average production results as found under the new system,

which afforded an average illumination over the test period of 13 foot-candles. With the largest lamps in the test illumination was approximately 22 foot-candles.

It was found that ninety-eight distinct operations were performed in the press department while the investigation was in progress. However, there were a great many minor operations so far as the test was concerned—that is, operations which were not carried on for more than three or four hours under each of the two systems of lighting—and eliminating these there remained twenty operations from which definite conclusions were warranted as to production changes under the original and new systems of illumination.

SUMMARY OF INVESTIGATION

Plant	Dover Manufacturing Company, Dover, Ohio
Product	Electric, gas and ordinary sadirons for home and laundry use.
Test area	Press department (29 ft. x 112 ft.).
Press department personnel	Foreman, ten operators, three helpers.
Old lighting equipment	Twenty-two 50-watt clear lamps—no reflectors. Ten 100-watt clear lamps—two with reflectors. Average illumination, 0.7 foot-candle. Average illumination at tool point, 4 foot-candles
New lighting equipment	Twenty-seven "RLM" standard-dome reflectors with bowl-enameled lamps. Average illumination, 13.5 foot-candles.
Cost of old lighting system per year*	$290.00
Cost of new lighting system per year*	$800.00
Increased expenditure for lighting	$510.00
Payroll per year	$20,000.00
Percentage of increased lighting cost to payroll	2.50
Percentage increase in production due to modern system of illumination	12.20

* Cost of energy, 4 cents per kilowatt-hour.

Of the twenty operations it will be seen from the accompanying tabulation that fifteen showed increases in production, four indicated decreased production and one showed no change. The operation which showed neither loss nor gain was one which required no special discrimination of details. It consisted merely of picking up an iron, laying it in a jig, pulling a lever for drilling, and then removing the iron. Operation No. 6-G-42-½, which showed an increase in production of 210 per cent, required very close discrimination. It consisted of accurately locating the center of an iron casting with dividers and then center-punching for drilling. The four individual operations for which decreases in production were indicated come under the head of drilling operations or of tapping operations. It will be noted in the tabulation that in each of these two groups there are several operations carrying separate numbers and listed separately; for example, there is one operation number for drilling a hole in a certain part and another operation number for a differently sized hole or for a hole in a differently sized iron. As a matter of fact, if all drilling operations are placed in one group and likewise all tapping operations in one group, it will be found that in each case the gains in production more than offset the apparent losses. In other words, the precision with which the data could be recorded (to the nearest half hour) and the variation in the quality of the material worked upon were such that it is dangerous to place too much weight on the exact percentage of gain or loss indicated for any one operation. When all of the figures are averaged to obtain the production of the shop as a whole, many possible sources of error, such as those due to recording time and to variations in material, are eliminated.

In order to determine the percentage increase in efficiency of the shop as a whole, it was necessary to weigh each operation in proportion to the total number of hours devoted to it. It was considered that the relative shop importance of any one operation was simply the ratio of the number of hours spent on the operation during the investigation to the total number of hours spent on the twenty operations tested. It is readily seen that the short-time operations thus have very little weight, whereas the operations which were worked upon for a long duration are given greater weight. The result of the investigation, with the operations weighted as described above, indicate that at an increased expenditure for lighting of approximately 2.5 per cent, production in the press department was increased 12.2 per cent.

There were several operations on which sufficiently accurate data were not obtained to warrant tabulation in this summary, but which also showed increased economy in operation. For instance, under the original lighting system it was necessary to drill and tap two pieces used in making the electric iron, load them on trucks, assemble them in an area where there was daylight, and then carry them back into the shop for further tapping. Under the new system of illumination it is possible to assemble the pieces right at the machines. Again, it had been the custom to have several men work on Saturday afternoons to clean up the shop. After the new system was installed it was found that the department was kept in a more orderly condition during the week and it was possible to dispense with Saturday afternoon work. This saving alone was sufficient to defray a large part of the lighting cost.

One of the operators stated that the drop cords they had previously been using interfered with his movements about the machine; another, that although he believed he would not produce more work under the new system, the work he would produce would be of better grade. A helper who cleaned up the steel scrap from the punch presses remarked that the new system offered safety protection in that he could now see the sharp, ragged edges of the scrap. Some of the other comments made by the men in regard to the increase in illumination were: "Room appears to be larger"; "More pleasant to work under the increased illumination"; "It will be impossible to do very much stalling on the job in the future." The company officials were equally impressed with the new lighting and have purchased the equipment used in the investigation. At their request a complete illumination design was made for the entire plant, and parts of this new system are already installed.

PRODUCTION DATA FOR PERIOD OF INVESTIGATION

Factory Operation Number	Factory Operation	Pieces per Hour Old	Pieces per Hour New	Change in Production, per Cent	Time per Operation, Hours
1–32	Drilling	133	164	23	49½
1–33	Tapping	293	258	—12	32
6–G–11	Milling	54	60	11	57½
6–G–11½	Spotting	188	222	18	14½
6–G–42½	Punching	42	130	210	20
6–G–43	Drilling	59	52	—12	27
6–G–44	Tapping	82	108	32	16
62–3	Drilling	420	519	24	31½
62–4	Tapping	490	609	24	34
72–3	Drilling	255	255	....	194½
622–4	Drilling	535	464	—13	130½
901–5	Blanking	1,517	1,652	9	48
911–1	Blanking	916	1,034	13	48
911–2	Shearing	1,074	1,800	68	33
921–1 and 2	Blanking	849	962	13	43½
921–4	Reforming	1,043	1,534	47	28½
921–5	Punching	1,125	1,296	15	25
922–4	Tapping	447	399	—11	38½
C–97	Blanking	1,495	1,517	1	10
.....	Plugging	90	98	9	118½

The foregoing tests were conducted jointly by the management of the Dover Manufacturing Company and the engineering department, National Lamp Works.

The Public Utility from the Customer's Viewpoint

Common-Sense Business Dealings Essential to Popular Understanding of Utility Affairs—Frankness and Liberality of Policy Build Good Will

By Bert H. Peck
General Manager Southern Illinois Light & Power Company, St. Louis, Mo.

THE relationships between public utilities and those whom they serve are being viewed in a new light and their importance appreciated not only by the utilities but by representatives of the public as well. In spite of all that has been said in the past on this subject, including the advancement of many theories, it is doubtful if sufficient attention has been paid to the common, every-day methods of obtaining and maintaining satisfactory relations. Recent publicity has done much to emphasize the need for active co-operation and to pave the way toward a better understanding. Thus the utilities' part in the program has been made easier.

Formulas and set rules cannot be applied to public relations. Each situation requires individual treatment, with methods varying over a wide range in different localities. The problem in a large city is usually very different from that in the smaller community. None the less, there are certain considerations which in my opinion are fundamental and generally applicable in cities of less than 100,000 population, and I believe that if these are met, the remainder of the problem may be solved according to local requirements.

Public Relations Not Complicated

The question of public relations is one which has been needlessly complicated in the past owing to the belief that it presented a very peculiar problem, entirely dissociated from the relationships prevailing between most business enterprises and their patrons. Rapid development, indeed, has characterized the public utility field. Types of equipment and methods of transmission and distribution have undergone swift changes. This development has drawn into the field educated men who are inclined to the technical viewpoint, and, in the past at least, often to the exclusion of adequate consideration of public relations. These are equally important in the problems of generation, transmission and distribution. In reality, public relations matters deserve the best talent in the industry, without theorizing and speculation, and with the production of results by good common-sense methods.

The public utility in a community is engaged in a business just the same as every other commercial enterprise in the community. The public has been educated to the average retail merchant's methods of doing business, and if an attempt is made to consider the public utility business upon a different basis, the public naturally opposes the idea and will join in an effort to place utility service upon the ordinary plane of transactions. Although there are essential differences between public utility service and the grocery or the hardware business, there are also many elements in common which should be recognized. If these common elements are recognized by the public utility, the public will then more nearly accord the utility the treatment it gives other enterprises. The avoidance of complications in handling complaints, undue routine and emphasis upon theoretical elements in dealing with the public, so far as possible, will be most helpful. Although the public utility is a natural monopoly with its attendant advantages and disadvantages and as such is subject to governmental regulation, these differences over ordinary business can be explained by common-sense publicity with a groundwork of fair dealing. Let the utility meet the public and inform the latter regarding its business as freely as other merchants, striving to get rid of annoying methods which the public does not understand or appreciate.

The monopolistic character of public utilities is perhaps the greatest single feature which has given rise to discord in public relations. A person becoming dissatisfied with the public utility has no other source to which to look for his service. He may become dissatisfied with a retail merchant and go across the street to his competitor; then in turn he may again become dissatisfied and go back to the first merchant. With the average citizen we know that this changing about is constantly occurring. The dissatisfied public utility customer is resentful in many cases because of the absence of an alternative source of supply, and this imposes an additional responsibility upon the utility to maintain a good public relationship. It places requirements upon us which are more severe than the average business experience, but this does not relieve us from meeting the situation face to face if we are to keep the good will of our patrons.

It is scarcely necessary to state that one of the primary requirements for maintaining satisfactory public relations is that the broad general policy of the utility shall be one of absolute fairness, sincerity and co-operation. This is true of any business enterprise. With a utility it is much more essential that its business shall be conducted along broad-minded lines of fair dealing in order to counteract antagonism to the existence of a monopoly. We in the industry know that at the present time practically all utilities are conducted upon this basis. There has been a change in the attitude of all business enterprises in the past twenty years in this respect. The permanently successful business enterprises are indeed those which desire a square deal alike for themselves and for their patrons and which refuse to take advantage of conditions that in some cases might appear to be temporarily profitable though open to objection from the public relations standpoint.

"Service" a Widely Inclusive Matter

That good public relations depend on satisfactory service is axiomatic. The term "service" should be considered in a very broad sense. It is too often considered as applying only to voltage and continuity of supply. It should be extended in all cases to include the attitude of the utility representatives, their treatment of the public and their general conduct. A retail establishment, selling good material and not misrepresenting it, might in a narrow sense be selling satisfactory service, but in a broad sense the service to be satisfactory requires a congenial atmosphere and one conducive to the attraction of business to the establishment.

The voltage on the lines of a public utility may be held within reasonable limits and there may be no service interruptions, but satisfactory service from the public relations viewpoint includes also an attitude of officials and employees which makes the public glad to do business with the utility and certain of the justice which will be accorded individual complaints. It is a

profitable thing for a utility to check this carefully and see whether its representatives are enthusiastically "boosting" the company and exhibiting faith in its honesty and integrity. If in any case such is not the situation, the fact is bound to be seriously reflected in the public relations of the company.

CONSTRUCTIVE COMPLAINT BEST SUGGESTION

Complaints, so closely identified with service matters, should not be regarded as something unusual or to be shunned. Constructive complaints received offer a company its best opportunities to remedy defects in service. Assumption by a company that no or very few defects exist is most likely to be made by a utility most seriously in need of improvement. All representatives should be trained to investigate complaints thoroughly, not merely to satisfy the customer temporarily, but to remove the cause of complaint so that the general service may be improved and the opportunity for the repetition of defects eliminated. They can only be trained in this attitude by first placing them in a proper frame of mind as to their own relationship to their employer.

Another fundamental element in good public relationship is the acquaintanceship which the representatives of a company have with the consumers personally. The average retail merchant depends for a large part of his patronage upon his personal friendship with the people whom he serves. The public utility should take every means to become acquainted with its customers, not by forced methods, but through the idea of co-operation in both business and personal ways. To defer the making of friends until the need for them arises is a serious mistake; no other business can be conducted successfully upon that basis, and neither can a public utility. Personal friendship between utility employees, officials and the public enables the company to keep in touch with popular feeling and to anticipate complaints to a greater degree than by any other method.

TELL THE PUBLIC ABOUT THE UTILITIES

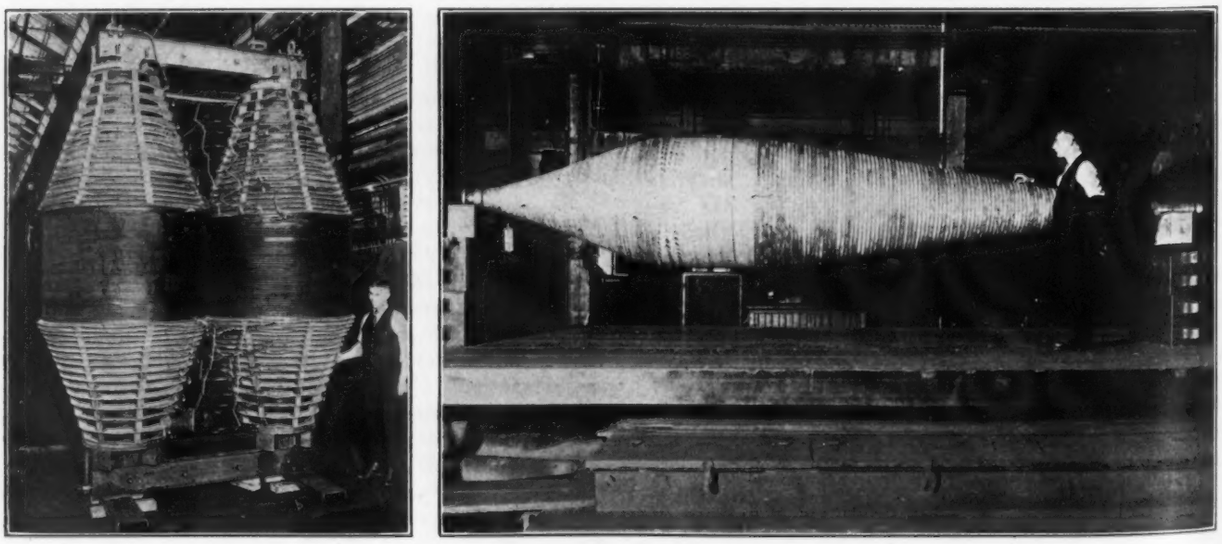
Another phase of public relationship which has received much attention lately, but no more than it deserves is the spreading of general information regarding the public utility business. The elements of difference between this and ordinary business should be explained so that the average citizen will understand the public utility business as fully as he does the grocery or hardware business. The utility should not wait until an emergency arises in its public relations to explain these matters, but should consistently and thoroughly every day of its existence take every opportunity to explain details of commission regulation, the meaning of load factor, of off-peak service, etc. It should explain why it has a monopoly and how the public benefits by this fact. It should also explain to the public the efforts it is making to maintain service under adverse conditions, to increase its plant capacity to keep up with the demands, and should repeatedly call the public's attention to the vital part it is playing in the city's development and the need of the public for its service.

If the public can be brought to understand thoroughly the public utility business as it understands most lines of business, and if the utility will then follow the same line of procedure which the average successful business man follows, it will be in the best possible position to meet an emergency in its public relations and under most conditions need have little to fear from this source.

Million-Volt Transformer with Bushing 19 Ft. Long

A 1,000-KVA., 1,000,000-volt transformer is being built by the Westinghouse Electric & Manufacturing Company for the experimental laboratory at Trafford City, Pa. The accompaning illustrations show its relative size, but they do not indicate the immensity of the transformer. In the windings there are nearly 70 miles (112 km.) of wire. The transformer is built on the principle of distributing electrostatic stress as developed by C. L. Fortescue of the Westinghouse Company seven or eight years ago.

The terminal bushing is the largest ever built in the Westinghouse shops. Special machines had to be fitted to turn the bushing on this account. Its length is 19 ft. (5.7 m.) and it is 41½ in. (104 cm.) in diameter. The static shield will be 10 ft. (3 m.) in diameter and 20 in. (50 cm.) deep. The bushing will weigh about 9,000 lb. (408 kg.) when completed.



WINDINGS AND TERMINAL BUSHING OF 1,000,000-VOLT TRANSFORMER

Inductive Interference as Seen by the A. R. A.

Railway Men Overlook the Result of Communication or Telegraph Circuits Being Equipped with Apparatus Which Is Unduly Susceptible to the Influence of Power Circuits

A REPORT recently submitted by the inductive-interference committee of the American Railway Association includes among other things a description of the causes and effects of inductive interference as seen from the viewpoint of the railway industry. The report of the committee, which has been accepted for submission by letter ballot for inclusion in the manual of the association, will be interesting to central-station men. In analyzing it the reader should keep in mind the attitude with which the discussion has been approached. It is that the interference is entirely a problem created by the presence of the power circuits. Although this is true in a sense, since there would be no problem if there were no power circuits, the angle not considered in the discussion is the situation that may result if the communication or telegraph circuits are equipped with apparatus that is unduly susceptible to the influence of the power circuits with which they may be parallel. This is a phase of the inductive-interference problem that is receiving increasing attention and should be fully carried in mind in any study undertaken. What this factor may amount to is a question that only future study can answer. The first section deals with the theory of inductive interference and is not reproduced here, but the second section follows:

Causes and Effects of Inductive Interference

Inductive interference as considered in this report is understood to mean detrimental inductive effect on telegraph and telephone circuits caused by adjacent power circuits or systems. The effect is to impair or destroy the service in the communication circuits affected and in the most severe form may also be responsible for damage to property, personal injury or loss of life. Apart from the personal injuries which may be the immediate result of an acoustic shock, sometimes called a "bat in the ear," received by the exchange operators, dispatchers and others using the circuits, or of shocks received by the linemen or maintainers working on the circuits, there is a certain demoralizing effect on the service caused by fear of a possible repetition of these abnormal conditions.

Inductive interference from telegraph circuits or telephone circuits (metallic or grounded) may also exist with parallel communication circuits. If either the circuits which produce the interference or the circuits affected are metallic, the interference can be reduced by suitable transposition schemes, which are covered by specifications of sub-committee D (transpositions) of committee No. 1 (construction and maintenance, outside plant).

Inductive interference with telegraph and telephone circuits may be caused by either the normal operation of the adjacent power circuits or abnormal conditions which may occur as a result of short circuits, grounds or opens in the power circuits, switching operations, electrolytic lightning arrester charging, or sudden changes in the power load.

Inductive disturbances may be of a most serious nature, and the railroad companies are unable by themselves to cope with the problem of protecting their lines and service against them. In order to make this more clear, some of the fundamental characteristics of telegraph and telephone service are reviewed briefly, together with some of the distinctive features of the plant which are required to make this service possible.

The fundamental technical problem of telephony is threefold—(1) the production of an electrical wave which is a faithful copy of the spoken word; (2) the transfer of this wave without appreciable delay over distances which may amount to hundreds or thousands of miles without excessive change of form by distortion, without the accession of foreign disturbances and without undue loss of intensity; (3) the production at the receiver of an audible sound wave which is an adequate counterpart of the electrical wave and therefore of the original spoken word.

As speech is carried on telephonically by means of an extremely small amount of energy, it is necessary that a large part of the telephone plant be of a sensitive and delicate construction. This includes the telephone sets where occur the delicate transformations from air wave to electrical wave and vice versa.

A large proportion of these telephone sets cannot be located at central points where they would be under the constant supervision of maintainers, but must be placed at outlying points.

Telegraph systems, transmitting electric impulses according to a signal code, have the same fundamental problems of faithful reproduction of signals and operating on small energy with delicate apparatus.

From this brief consideration of the communication problem, showing that a large portion of the telegraph and telephone system is inherently of a delicate nature and susceptible to interference, it is clear that communication apparatus circuits would be destroyed if but a small fraction of the powerful currents and voltages used by other electric utilities were permitted to enter into the telegraph or telephone system.

CLASSES OF INTERFERENCE

The interference may manifest itself in the railroad telegraph and telephone plant in the following ways:

1. Interference with operation:
   - (a) Interruption of service.
   - (b) Noise.
   - (c) Interference with telegraph communication.
   - (d) Interference with telephone signals.
2. Physical injury to plant; e.g., fire hazard, damage to apparatus or protective apparatus.
3. Hazard to employees:
   - (a) Electric shock.
   - (b) Acoustic shock.

Interruption of Service—Induced voltages may be high enough to operate the protective devices and, if the current across the protector is sufficient, the line will become permanently grounded and the communication service interrupted until the protector is restored to normal condition. If the protector is located in an exchange, the time required to make repairs is relatively

short, but if it is at an outlying point considerable time may be required for a repairman to reach that point. In cases where the operation of the protector does not actually ground the line, it may lower the insulation resistance sufficiently to make the line noisy.

In order to appreciate the effect of small currents in producing noise in telephone circuits, it must be considered that a very small fraction of a microwatt of power at voice-current frequencies will produce an audible sound in a telephone receiver, and a few microwatts are sufficient for a telephone conversation in a quiet place. When the current in the telephone receiver caused by induction from an outside circuit is large enough to produce an audible sound it has an important effect on the efficiency of the circuit for transmitting speech, particularly when the circuit is used for talking over long distance so that the energy of the voice currents approaches the minimum which will give a satisfactory conversation. An extraneous sound which is scarcely audible to an untrained ear and might be thought to be of negligible consequence frequently may have the effect of seriously impairing a telephone circuit, or, otherwise expressed, of destroying a material part of the value of the circuit, for service.

The interfering effect of foreign current of a given magnitude depends very largely upon the frequency. The maximum effect on telephone conversation is for current having a frequency of about 1,100 cycles per second. At lower frequencies the effect falls off rapidly and at 25 cycles is probably only about one two-hundredths as great as from 1,100 cycles. If noise is caused, it is due to the higher harmonics of the 25-cycle and 60-cycle currents and voltages. Owing to the lower fundamental frequency, 25-cycle power systems produce relatively smaller noise effects than 60-cycle systems. Noise from power circuits is liable to become especially serious under any conditions which produce a bad wave shape in the power circuit.

Interference with Telegraph Communication—Interference with telegraph circuits is greatest at frequencies of the order of 10 to 100 cycles per second; thus at 25 cycles an induced current of the order of 1 milliampere is liable to reduce the efficiency of ordinary Morse transmission, while rapid telegraph systems, printers, etc., are more or less impaired by even smaller extraneous currents. Serious interference is also encountered from 60-cycle and, in some cases, from 180-cycle induction. Harmonics higher than 180 cycles, in general, have little effect upon the telegraph circuit.

Interference with Telephone Signals—Interference with telephone switchboard signals or false ringing of telephone bells may be caused by abnormal conditions, such as short circuits, grounds, etc., existing in the adjacent power system. These conditions are not usually produced under normal operation.

Fire Hazard—The use of heavy insulating coverings for wires in telegraph and telephone switchboards is impossible on account of the necessity of bringing many wires within a limited space. It is not feasible to employ for this purpose such insulation as is considered good practice for electric light and power wires, nor is it necessary under normal operating conditions. Thus it is unavoidable that the dielectric strength of the telegraph and telephone wiring be relatively low.

Investigation of the fire hazard due to foreign voltages impressed on telegraph and telephone lines indicates that voltages of 200, or even less, when backed by considerable power, as in the case of induced voltages from an alternating-current system, may create a fire hazard. Fire hazard is reduced by the proper installation and maintenance of inside wiring in accordance with recommendations of committee No. 2 (construction and maintenance inside plant) and of protective apparatus in accordance with recommendations of committee No. 4 (protection against lighting or electric light and power circuits).

Electric Shock—At times of short circuits on the power circuits and sometimes during switching operations electrical surges may be set up in the communication circuits which are of sufficient intensity to produce electrical shocks to persons using or working on the circuits at the time. While it is unusual that such shocks will be the cause of serious personal injuries, even minor shocks are objectionable.

Acoustic Shocks—Inductive surges that are capable of producing electric shocks to persons also are liable to cause loud noises in the telephone receivers which may result in acoustic shocks to persons using the telephone at such times.

BALANCED AND RESIDUAL VOLTAGES AND CURRENTS

In analyzing inductive phenomena it is advantageous to classify power circuit voltages and currents under two general heads:

1. Balanced voltages and currents; that is, those which are balanced or symmetrical with reference to the earth.
2. Residual voltages and currents; that is, those which are wholly unbalanced with reference to the earth. The circuit of the residual voltages and currents is composed of the metallic circuit conductors as a group, constituting one side, and the earth (including grounded conductors), constituting the other side.

At every instant the algebraic sum of the balanced currents and likewise of the balanced line voltages is zero. Hence, at any instant the algebraic sum of the currents in the line conductors is the residual current, and similarly, the algebraic sum of the voltages to earth of the line conductors is the residual voltage. For example, in an ordinary railway circuit, consisting of overhead trolley wire and grounded rail return, all the voltage and current are residual.

There is no definite relation between these two classes of voltages and currents, and different means usually have to be taken in counteracting their respective inductive effects. In general, the residuals cause more inductive disturbance than the balanced components, as the residuals are all in phase and their effects are cumulative, whereas the induction from the balanced voltages and currents in one conductor is partially neutralized by the induction from balanced components in each other conductor of the circuit. Also, the residuals frequently contain a larger proportion of harmonics than the balanced components, and this is another reason why they are likely to cause more disturbance, particularly to telephone circuits.

PRINCIPAL FACTORS IN DETERMINING INTERFERENCE

A general statement of the principal factors which determine the amount of induction and whether it is sufficient to constitute interference is as follows:

Length of the Parallel—Other things being equal, the longer the parallel the greater the interference.

Separation of the Two Classes of Lines.—In general, other things being equal, the less the separation of the power line and communication line the greater the induced voltage.

Configuration of the Power Line—The investigations of the California Joint Committee on Inductive Interference show that the configuration of the power line has an important bearing on inductive effects, the relative merits of different configurations varying with the separation between the power and communication lines, the spacing of the power conductors and the relative importance of balanced voltages and currents. While it is not possible to draw a simple general rule for determining the most advantageous configuration, the differences in particular cases are marked and deserve special attention, as oftentimes substantial benefit can be secured in this way at small additional cost. This is particularly true of multiple circuit power lines, the resultant induction depending largely on the relative poling of the power circuits.

Voltages, Currents and Frequencies of Power Circuits.—The effect of electric induction is proportional to the voltage of the power line, and that of magnetic induction to the current in the power circuit. Induced currents are usually, for both cases, approximately in direct proportion to the frequency.

Magnitudes of Residual Voltages and Currents—The residual voltages and currents are a principal cause of inductive interference. Hence, while the amount of residuals on metallic circuits is usually small as compared with the balance components, the inductive effects of the former are liable to preponderate.

The effect of wave shape on interference, particularly to telephone circuits, is exceedingly important. Wave shapes in practice on different power systems are found to have extremely

wide variations. An unfavorable wave shape—*i e*, one having a large proportion of high harmonics—may make the telephone circuit inoperative, whereas the fundamental frequencies would have little or no effect.

A meter for measuring directly the telephone interference factor of power circuit voltage waves has been developed. When connected to power apparatus or circuits, this instrument gives a reading which is approximately proportional to the interfering effect of the voltage wave when acting by induction on telephone circuits, other conditions remaining fixed. Articles on the design and application of this meter have appeared in the publication of the American Institute of Electrical Engineers.

Unbalance of Metallic Communication Circuits

Such unbalances are caused by inequalities in resistance or inductance of conductors and insulation resistance or capacitance to ground. The inductance and capacitance are balanced approximately by transposing the conductors. The other elements enumerated require proper design, construction and maintenance of these lines, whether in open wire or in cable, together with their connected apparatus. The following factors are of great importance in determining the amount of noise produced in telephone circuits by voltages induced between wires and ground: high resistance joints, broken or dirty insulators, low insulation resistance, defective cable terminals, contact with trees, etc.

The sensitiveness of the terminal apparatus is an important factor in determining the allowable amount of induction. Also, if the parallel is at a considerable distance from either terminal of the communication circuit, the induced voltages and currents may become considerably attenuated before reaching the receiving instruments. Prospective developments as well as present conditions must be given consideration.

The voltage and currents of power circuits under abnormal conditions, which are liable to be largely residual in character, produce the most severe inductive effects. The values of these quantities under abnormal conditions, in relation to corresponding values under normal conditions, vary a great deal on different power systems.

Number of Parallels Which May Affect Communication Circuits

In many cases the same communication circuit, especially if it be on a long trunk line, may be involved in a number of different parallels. In such cases the induction contributed by each parallel must be sufficiently restricted so that the cumulative results from all will not produce disturbances which cannot be endured.

Importance and Character of Use of the Communication Circuit.—It is obvious that the more important circuits on which interference is most serious should be afforded a higher degree of immunity from disturbance than circuits of less importance. The character of the communication circuit, as, for example, whether it is a telephone or telegraph circuit, is of fundamental importance in considering the question of inductive interference.

Volume of Transmission of the Communication Circuit.—In case of a long-distance telegraph or telephone circuit, where the volume of transmission is small, a less amount of extraneously induced current will interfere with receiving than on shorter circuits where there is a large volume of transmission.

Relative Cost of Preventing Interference.—While in all cases means should be employed which will allow adequate communication service to be given, still it is not expected that complete freedom from inductive disturbance can be obtained. Any induced voltage, no matter how small, will generally cause some impairment of service. The amount of induced voltage which it is justifiable to allow depends to some extent on the difficulty and expense involved in further reducing such voltage. After the foreign voltage has been reduced to an amount which can, if necessary, be tolerated, it becomes simply a problem of balancing the value of further improvement against its cost.

It will be seen that the number of elements affecting inductive interference is quite large. Moreover, some of these elements—for example, the wave shapes of the power circuit voltages and currents—are not ordinarily known and have induction-producing values varying enormously in different cases. Hence there is difficulty in formulating any simple method of determining in advance whether a given construction will or will not produce interference.

More Than 20,000 Cu.Ft. of Water for Every Ton of Coal

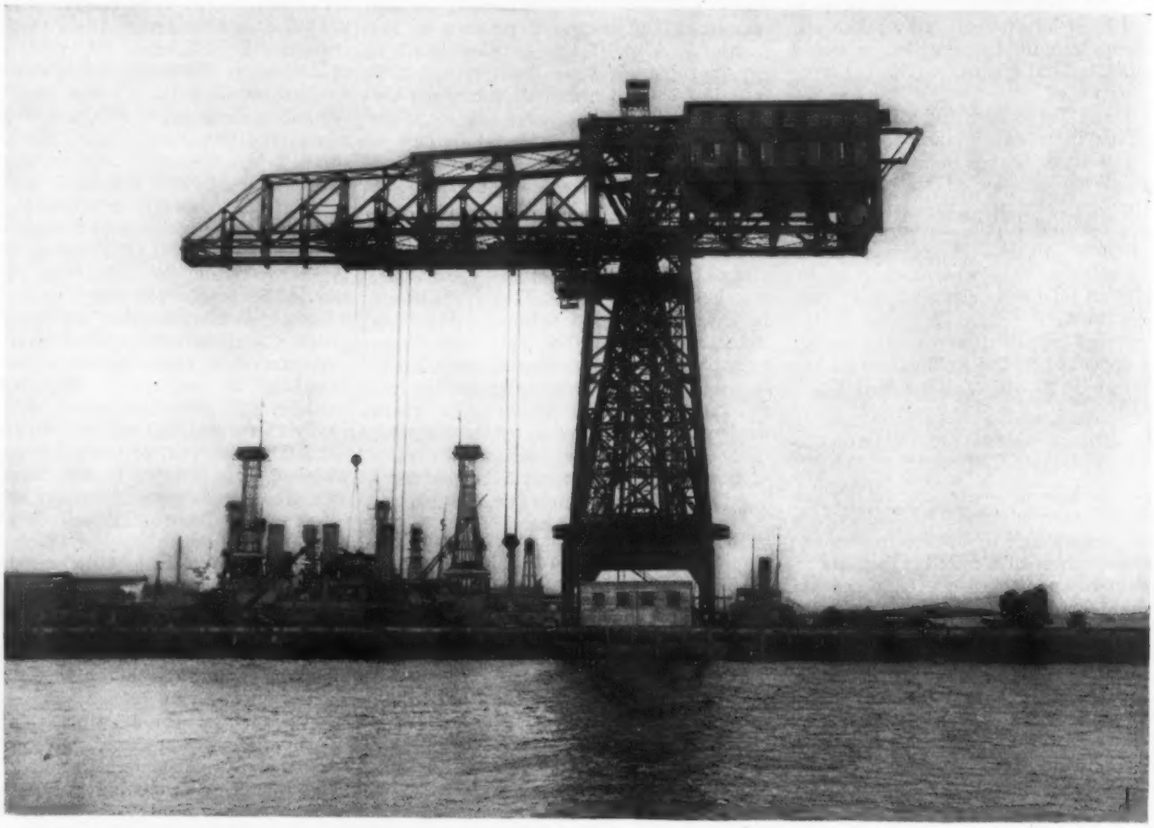
MOST persons, and even many officials of power companies, believe that coal is the big commodity the power company has to handle. The large stockpiles and the machinery installed for handling are things which make a decided impression on the public, and the amount of the coal bills paid by the companies makes the officials and stockholders realize the great quantities of fuel required. Unfortunately, however, the quantity of coal handled is far from being the biggest thing. The supply of circulating water is a much larger undertaking. A good central station will evaporate about 8½ lb. of water per pound of coal burned, so that the quantity of boiler-feed water handled is many times that of the coal used. However, as the steam is condensed and then returned to the boilers for re-evaporation, the quantity of feed water required to keep the plant in operation is comparatively small, being only that needed to make up the losses by leakage, etc. Now, with the vacuum maintained in the average modern station averaging within less than an inch of the barometer, the quantity of circulating water required will be about seventy-five times the weight of the steam to be condensed. Therefore for every pound of coal burned under the boilers the station needs about 640 lb. of circulating water; and, moreover, this water cannot be very warm or the vacuum will be impaired, thereby reducing the output of the station. The water should be reasonably clean and must be free from foreign matter such as acids, which would destroy pump runners, condenser tubes and similar apparatus.

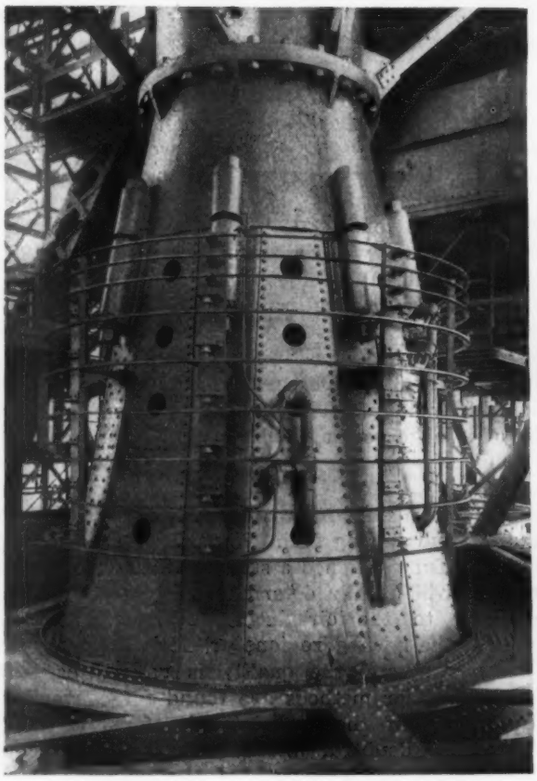
Take a power plant of average size, say one that burns 200,000 tons of coal a year, and it will be seen that its annual water requirement is about 128,000,000 tons, or about 4,100,000,000 cu.ft., that should have at all times a temperature less than 70 deg. Fahr. On many days during the year this station will burn more than 1,300 tons of coal per day and require over 832,000 tons, or 26,600,000 cu.ft., of circulating water each twenty-four hours. Therefore, in determining the location of a large power plant the first requirement to be satisfied is that of an ample supply of cooling water for the condensers.

The next step is reasonable facilities for obtaining, handling and storing fuel. Where both these conditions cannot be fully satisfied a study of the economics of the situation will usually determine that preference should be given to the circulating-water supply. Unfortunately, the mining regions are lacking in the needed water supply and the quality is usually bad; therefore until other methods are found for converting the heat energy of the coal into the form of electrical energy it is doubtful whether any large power plants will be built at the mouth of the mine or alongside very large culm piles.

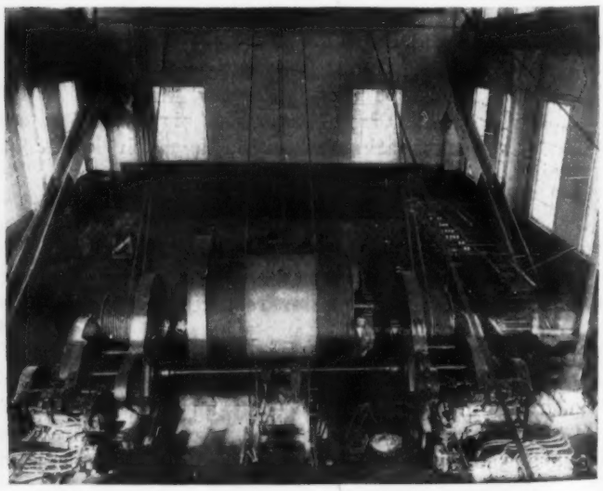
This information was furnished by I. E. Moultrop, assistant superintendent Construction Bureau, Edison Electric Illuminating Company of Boston.

There Are Few Operations Which Cannot Be Electrified Advantageously





IT IS NECESSARY only to look around any progressive industrial plant, ship or railroad terminal or similar place to get an idea of the many ways in which electricity has been applied to make material handling less expensive in time and labor. The surprising thing is that there is not a more general application of the material-handling equipment which has been tried and proved economical. One way in which to correct this condition is for every manufacturer who makes this equipment and every central-station power sales engineer and consulting engineer who recommends it to take aggressive steps to disseminate broadcast the experience of those who use it.



In the accompanying illustration is shown what may be considered a unique installation, but it indicates that practically no material handling problem exists which cannot be electrified advantageously. This installation, which consists of a hammerhead crane at League Island Navy Yard, Philadelphia, has been in satisfactory operation for several years. It is rated at 350 gross tons and has a radius of operation of 115 ft. The contact rings that collect current for the operating equipment at the head of the crane are shown at the left and the hoisting machinery at the right. Electrical control and safety devices perform a very important part in the operation of this gigantic crane.

Determination of Line-Loss Expense*

Can Be Based on Equivalent Hours of Peak-Load Usage—Method of Applying to a Specific Case—Corrections for Special Conditions—Range of Values for Equivalent Hours

By P. O. REYNEAU† and H. P. SEELYE

IN ORDER to design a line for the transmission of electrical energy it is necessary to consider the total yearly cost of the energy losses in relation to other costs. Usually it is convenient to obtain the energy losses per year in terms of the load carried. By "load carried" is meant the peak load for the year, since it is for that load that the size of the wire and transformers must be determined. Since the energy loss over a line is dependent on the square of the current at any time, it is evident that the total loss is not proportional to the load factor because the load factor is determined from the average load and hence involves only the first power of the load at any time. The computation of total energy loss in terms of peak load must be based on the square of the loads at any time. For this purpose it is therefore convenient to determine for each of the various classes of load considered a quantity called the "equivalent hours."

"Equivalent hours" may be defined as "the average number of hours per day which it would be necessary for the peak load of the year to continue in order to give the same total energy load as that actually given by the variable load throughout the year." It is a quantity which, if multiplied by the loss at peak load on any line, gives the average loss per day over the year. If this average daily loss is then multiplied by 365 the total yearly loss in kilowatt-hours is obtained. This multiplied by the cost of energy per kilowatt-hour gives the annual cost of energy loss. It is evident that if the equivalent hours for any load and the peak demand of the year are known the total yearly cost for losses would be $I^2R \times t \times 365 \times C_e$, where I is the current at peak load, R is the resistance of the circuit, t is the equivalent hours, C_e is the cost of energy per kilowatt-hour. The quantity, equivalent hours, is also of use in determining the cost of energy per kilowatt-hour, since the cost of energy losses is a component of that cost.

If the characteristic curve for any type of load were available for a whole year, the sum of the squares of the current for each hour taken from that curve times the resistance of the conductor would give the total yearly loss in watt-hours. This, however, would be a tedious computation and in most cases impracticable. It is usually sufficiently accurate to obtain characteristic curves for each month, or at least a typical characteristic curve applicable to any month with allowance for the variations in the peak from month to month.

EXAMPLE OF APPLICATION

An example of an actual calculation of equivalent hours on residence lighting circuits will indicate a method which can be followed in such computations. The characteristic variation of the load on a residence lighting circuit from month to month was obtained from the following table of maximum current readings for each month during one year on twelve typical circuits in various districts and with various loads:

MAXIMUM CURRENT READINGS ON TWELVE TYPICAL RESIDENCE CIRCUITS (AMPERES)

Circuit	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	190	180	180	175	160	135	120	125	160	175	180	195
2	200	180	175	165	145	140	110	130	200	195	205	210
3	175	165	150	140	120	125	90	115	160	165	180	185
4	185	175	180	150	140	140	105	130	175	185	200	210
5	155	155	155	150	135	130	100	130	160	175	180	195
6	150	140	135	125	110	100	90	80	120	135	150	150
7	245	225	210	200	190	180	120	140	225	245	285	285
8	235	225	225	210	200	185	150	205	250	280	280	280
9	225	225	215	225	175	175	135	170	215	235	240	250
10	185	185	185	175	150	140	130	140	170	185	225	240
11	125	120	115	110	105	105	90	100	120	125	135	150
12	130	120	110	105	100	100	85	100	125	135	145	130
Total.....	2,200	2,095	2,035	1,930	1,730	1,645	1,325	1,565	2,080	2,235	2,405	2,480
Average of the 12.....	183	175	170	161	144	137	111	130	173	186	200	207

The curve on page 772, plotted from the above average values, indicates clearly the variation of the monthly peak loads on a typical circuit. Since the peak for the year occurs in December, the peak for any month may be expressed as a fraction of this yearly peak as follows:

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
0.884	0.845	0.820	0.778	0.695	0.662	0.536	0.628	0.835	0.898	0.965	1.00

Hence, for example, the maximum current for February equals .845 multiplied by the maximum current for the year, etc.

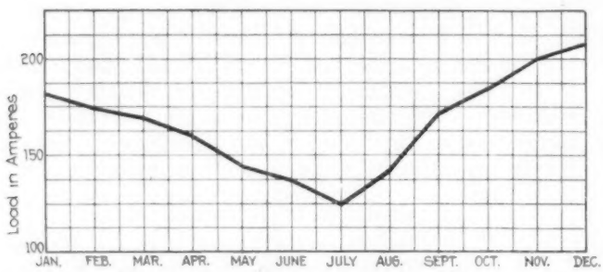
For convenience the I^2R loss for any month may be considered equal to the loss for a typical day in the month times the number of days in the month, since the variation of load from one month to the next is not enough to warrant more detailed computation. The I^2R loss in a feeder for any one day would be very nearly equal to the sum of the squares of the current readings for each hour during the day multiplied by R. For a great part of the day, however, the load on a lighting circuit is very light, the heavy load and hence most of the loss occurring within a few hours in the evening. By adding the squares of the hourly current readings throughout a day and dividing by the square

*Fourth installment of a series on Distribution Economics, see ELECTRICAL WORLD, Jan. 8, 1921, p. 79; Jan. 15, p. 146, and March 26, p. 703.

†Distribution engineer Detroit Edison Company.

of the maximum current for the day a figure is obtained which represents the number of hours for which the peak load for the day would have to be carried steadily to produce the same I^2R loss.

For a strictly accurate calculation, enough data should be available to determine the shape of the load curve on a typical circuit for one typical day for each month in the year. If this is not possible, however, a fairly accurate approximation may be arrived at if the load curves for only one or two months are available.



AVERAGE OF MONTHLY MAXIMUM LOADS ON TWELVE TYPICAL RESIDENCE CIRCUITS

If the equivalent number of hours at peak load for a typical day for these months is determined the equivalent hours for the other months may be calculated more or less accurately by making them proportional to the number of hours between sunset and about 10 p.m., allowing a little additional time in the winter months for the morning lighting peak. The figures obtained in the present case for these monthly equivalent hours at peak load will be found in the second column of the accompanying table.

The loss for any day in a month is proportional to the square of the maximum current for the day multiplied by the equivalent hours per day at peak load as obtained above. Therefore, if it is assumed that the average daily peak will be 95 per cent of the peak for the month, the loss for the day considered is proportional to the square of the maximum current for the month multiplied by $(.95)^2$ multiplied by the equivalent hours per day at daily peak load as determined above. The monthly peak, however, is equal to a certain fraction of the yearly peak as shown before, hence the loss for this day in terms of the yearly peak is proportional to the maximum current for the year, squared, multiplied by this fraction for the month, squared, multiplied by $(.95)^2$, multiplied by the equivalent hours per day at daily peak load. If this figure is multiplied by the resistance of the circuit, R, the actual loss is obtained. For example, the equivalent hours per day in terms of daily peak load as determined for February are four and one-half. The peak for February is .845 of the yearly peak. Hence, for a typical day in February the I^2R loss equals (yearly maximum current)$^2 \times (.845)^2 \times (.95)^2 \times 4.5 \times R$.

The total yearly loss would be the sum of the daily losses thus obtained. An average of the figures for each month would then give the average loss per day. Since the quantity (yearly maximum current)$^2 \times R$ is the loss due to the yearly peak load, the average number of hours per day which that load must continue may be obtained by averaging the other factor entering into the computation of average daily loss in terms of yearly peak. These are the quantities (equivalent hours per day at daily peak load) $\times \left(\frac{\text{monthly peak}}{\text{yearly peak}}\right)^2 \times (.95)^2$ as determined for each month. The resulting average is the value of "equivalent hours" for that load.

The following table shows the data worked out from the example of residence lighting considered:

Month	1 Equivalent Hours at Peak Load	2 $\left(\frac{\text{Peak for Month}}{\text{Peak for Year}}\right)$	3 $\left(\frac{\text{Peak for Month}}{\text{Peak for Year}}\right)^2$	1x3
January	5½	0.884	0.781	4.10
February	4½	0.845	0.714	3.21
March	3½	0.820	0.672	2.185
April	2½	0.778	0.606	1.67
May	2¼	0.695	0.483	1.088
June	1¾	0.662	0.438	0.767
July	2	0.536	0.287	0.574
August	2½	0.628	0.395	0.987
September	3¼	0.835	0.697	2.263
October	4	0.898	0.806	3.224
November	5	0.965	0.931	4.655
December	5½	1.00	1.00	5.500
Total				30.223
Average				2.519

$2.519 \times (.95)^2 = 2.27$ equivalent hours per day at peak load.

The preceding indicates that for the example used of purely lighting load the total loss for the year will be the same as if the peak load were carried 2.27 hours per day through the year.

Under certain conditions the preceding figures must be corrected, because actual loads on circuits were used and no allowance was made for the normal increase which might be expected on lighting load due to additional customers, the increased use of current by old customers, etc. For example, if distribution transformers are kept loaded nearly to capacity, new installations would care for the yearly increase and each individual transformer would show nearly the same load from year to year. In case the annual rate of increase is known, a correction can be applied to the figures given for each month to reduce it to the same maximum load for the year. In the example given the average yearly increase over a number of years was found to be 20.3 per cent, or 1.69 per cent per month. Assuming December as the yearly peak, the ratio of the peak for each month to the yearly peak was corrected by a proportional part of the yearly increase, *i.e.*, for November it was increased by 1.69 per cent, for October 3.38 per cent, etc.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
*Monthly ratio	0.884	0.845	0.820	0.778	0.695	0.662	0.536	0.628	0.835	0.898	0.965	1.00
Correction factor	1.177	1.160	1.143	1.126	1.119	1.102	1.085	1.068	1.051	1.034	1.017	1.00
Corrected ratio	1.040	0.981	0.937	0.876	0.778	0.729	0.581	0.571	0.878	0.930	0.980	1.00

$$\text{*Monthly ratio} = \frac{\text{peak load for month}}{\text{peak load for year}} \text{ uncorrected}$$

The preceding figures indicate that the actual corrected peak for the load considered is in January, but not enough difference will be introduced to necessitate a revision of the figures to that basis. If the equivalent hours are computed on the basis of the ratios given a new figure may be obtained for a loading with no yearly increase. In this case the equivalent hours thus corrected are computed to be 2.65 instead of 2.27 as determined for actual loading, with a yearly increase.

A further correction may be applied if, as in the case

of transformers, the full load capacity is to be used in studying losses rather than the actual load carried. If, for example, on the above circuits the transformers were carrying, on an average, 89 per cent of their full-load capacity, the equivalent hours based on connected capacity would be $2.65 \times (.89)^2 = 209$. That is to say, the year's loss in energy would be equal to the full-load current on the transformer carried 2.09 hours per day throughout the year.

The subject of equivalent hours should be carefully studied and as accurate figures as possible obtained for various classes of load. The values will vary, naturally, for different sections of the country as well as for different localities in the same section or on the same system. The habits of a community, as to hours of rising and retiring, etc., will affect the value for lighting loads. On power loads, of course, the nature of the industry will be a controlling factor. In general, for the cases coming within the experience of the writers, the values lie within the following ranges: Power load, from none to ten equivalent hours; residence lighting, from two to three equivalent hours; store lighting (small), from two to three equivalent hours; store lighting (large), two to five equivalent hours, and street lighting, five to ten equivalent hours.

Commercial Electric Trucks in New York City

Metropolitan District Accounts for 51 per Cent of Electric Street Trucks in Use in 1920—Vast Field for Development

NEW YORK CITY has adopted the commercial electric truck to no small degree. On Jan. 1, 1921, there were 52,128 electric trucks registered in the metropolitan district, which includes Greater New York and contiguous districts and cities in New Jersey and Westchester County. This is more than half the number of electric trucks registered in the remainder of the United States. Fig. 1 shows how the commercial electric truck has forged its way to the front in the larger cities of the country. It appears from these figures that more than 97 per cent of all the electric trucks in use are confined to cities east of the Rocky Mountains. Fig. 2 shows the increasing relative importance of original as compared with repeat orders. In 1920 there were eighty-six purchasers of electric trucks in the boroughs of Manhattan and the Bronx, of which fifty-two, or 60.4 per cent, were repeat orders. The eighty-six purchasers bought 536 trucks, of which 461, or 86 per cent, were purchased by companies formerly the owners of electric trucks.

The rapid disappearance of the draft horse in the boroughs of Manhattan and the Bronx is clearly defined in Fig. 3. During the two-year period from 1917 to 1919 the number of horses decreased by almost 30 per cent. On the other hand, the number of electric trucks increased by about 16 per cent in this period. A large portion of the displaced horse traffic was, of course, taken over by gasoline-driven trucks, but the figures clearly indicate the decreasing use of the draft horse in large cities and the consequent growth in the field of gasoline and electric trucks.

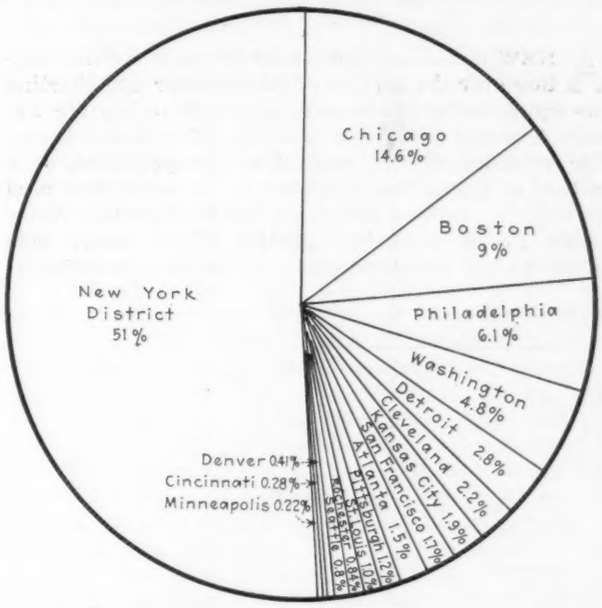


FIG. 1—DISTRIBUTION OF ELECTRIC TRUCKS BY CITIES

That the commercial electric truck is still only in its infancy is indicated in Fig. 4. Taking the United States as a whole, the possible field of development has hardly been touched as yet. It is only natural that the field of greatest electric truck sales activity should at first be confined in large part to the concentrated commercial areas, such as the metropolitan districts of New York and Chicago. As the electric truck proves its worth in these districts it will begin to become a real competitor of the gasoline truck in the less concentrated commercial areas.

The accompanying diagrams were developed by Charles R. Skinner for the Automobile Truck Bureau of the New York Edison Company.

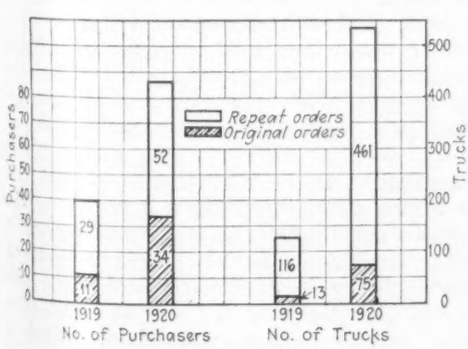


FIG. 2—NUMBER OF ORIGINAL AND REPEAT TRUCK ORDERS.

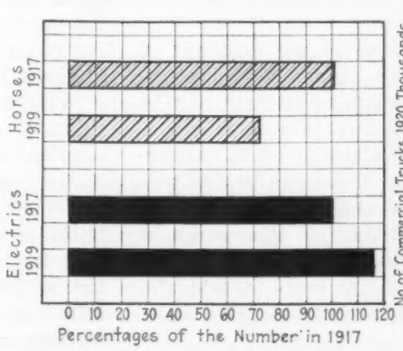


FIG. 3—DECREASING IMPORTANCE OF HORSE-DRAWN TRUCKS.

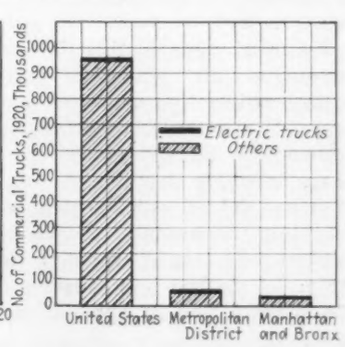


FIG. 4—LARGE FIELD FOR DEVELOPMENT OF ELECTRIC TRUCK

Measuring Potential Distribution Around Insulators

Water Is Sprayed Over Insulator and the Electric Field Is Explored in the Spray Method Developed in Sweden

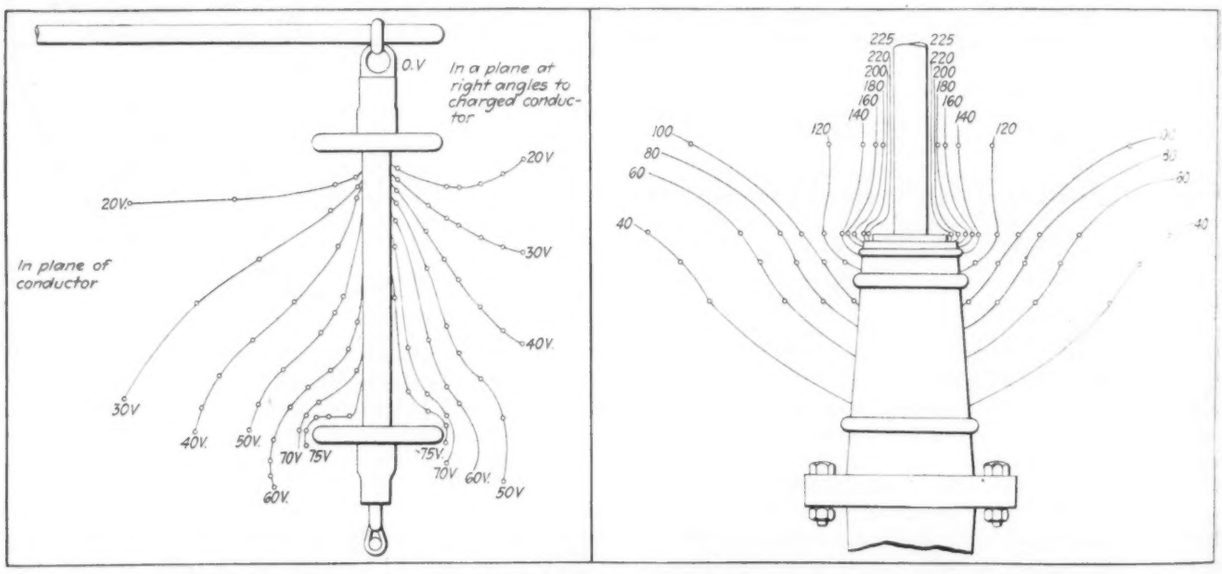
BY ALBERT P. STROM
Stockholm, Sweden

A NEW method of measuring the potential distribution over the surface of an insulator and charting the equipotential surfaces in the surrounding air has been developed by Harold Norinder of Upsala, Sweden, The principle of this method is an application of a method of measuring potentials in air which was used by him, in previous researches for the Swedish Water Power Board, in an investigation of the electric field in air during thunderstorms. In the determination of the characteristics of a particular type of insulator it is naturally of great value if one can in some way determine the form of the electric field surrounding the insulator. It is true that the potential distribution may be calculated, but this is a difficult operation and requires too much time for practical application. While the method has been used only for low voltage thus far, it appears to be suitable for high-voltage measurements as well.

Mr. Norinder's method is based on the principle of measuring air potentials with movable collectors. Either radioactive or water stream collectors may be used. It is a well-known fact that certain radio preparations will quickly acquire the potential of the atmosphere in which they are placed. The same is also true of a fine jet of water which becomes atomized before reaching the ground. Hence either of these may be used as collectors in exploring electric fields in air. The water-jet method was considered the more suitable for the purpose, and its application is given in some detail here.

An apparatus was constructed by which a fine stream of water was forced through a horizontal nozzle. This was set up so that the stream broke into drops in a vertical plane through the center line of the insulator to be investigated. This stream of water thus assumes the potential of the air at the point at which it is atomized. The nozzle is well insulated and is fed from an overhead supply of water which is also well insulated from the ground. Now, by attaching a static voltmeter, such as a quadrant, electrometer, at points between the nozzle and ground, the potential difference between the water stream and ground may be easily read directly.

By means of horizontal and vertical screw movements on the nozzle the water stream may be moved to any desired point with respect to the insulator being investigated, and by means of suitably attached scales the location of this point on a rectangular co-ordinate plot (containing also a side-elevation drawing of the insulator) may be read directly from the attached scales. A set of curves showing the equipotential surfaces in the air surrounding the insulator may thus quickly and easily be made. Diagrams of equipotential surfaces as obtained by this method are shown.



POTENTIAL DISTRIBUTION ABOUT INSULATOR UNITS DETERMINED BY EXPLORING ELECTRIC FIELD INTO WHICH WATER IS SPRAYED

In the trials thus far made with this method only direct-current voltages of 440 and less have been used. With the proper apparatus and instruments, however, there seems to be no reason why it cannot be used with much higher voltages. There is also nothing to hinder the method being used with alternating voltages, since the electrometer would then read the effective voltage of the point being measured. Thus it is hoped that the method may eventually be used with high-voltage insulators which will be subjected to actual operating conditions.

Another application is the investigation of potential distribution in the air surrounding a house when the building is in an electric field, as is the case during a thunderstorm. This may be done by placing a model of the particular building in an electric field. The distribution of the potential over the surface could then be determined exactly as for an insulator. Such a knowledge of the potential distribution would be particularly useful for lightning protection.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Edinburgh Meeting of the British Association for the Advancement of Science

To the Editors of the ELECTRICAL WORLD:

The recent meeting of the British Association for the Advancement of Science held in Edinburgh in September is not the first to be held in that historic city. Since the first British Association meeting in 1831 there have been meetings at Edinburgh in 1834, in 1850 and in 1871. Indeed, it is somewhat surprising that the city of Edinburgh should not have enjoyed a greater number of these meetings, because it is eminently well adapted for scientific gatherings of that kind. It is the home of the Royal Society of Edinburgh, a northern rival of the great Royal Society, whose fame is worldwide and whose residence is in London.

The presidential address by Sir T. Edward Thorpe was a remarkably clear and interesting epitome on recent chemical theories of the atom and atomic weight, with particular reference to isotopes. Isotopes are varieties of atoms having apparently the same chemical properties but differing in atomic weight. Thus chlorine has been found by a number of observers to possess the atomic weight of 35.46, on the oxygen standard of reference. "When, however, the gas is analyzed by the same method as that used in the case of neon, it is found to consist of at least two isotopes of relative mass 35 and 37." The belief is indicated that the oft-repeated value of 35.46 is merely a statistical average, and the persistency of this average is perhaps attributable to the fact that all the accurate determinations of this atomic weight have been made from samples of the substance derived from sodium chloride of the sea, wherein the mixture of molecules has been conducted impartially for ages, by winds and waves. Perhaps if samples of chlorine could be taken from independent original sources, other values of the atomic weight, ranging say from 35 to 37, might be found. Argon, neon, krypton, xenon, bromine, silicon and perhaps others are given as complex atoms; while fluorine, iodine, sulphur, phosphorus and arsenic are apparently simple elements.

The British Association divides itself into no less than thirteen sections, designated alphabetically, and at least one of them finds it desirable to proliferate. Each section has a section president, and each section president is supposed to arrive with an annual address in his pocket. The addresses, bound up together into a single little volume, make most interesting reading. Being authentic, and also usually devoid of unessential technicalities, they mark off the annual milestones of scientific progress in a manner that is welcome alike to the curious of this epoch and to the historians of the next.

The address of Prof. O. W. Richardson, president of Section A—mathematics and physics—discusses relativity, atomic structure, thermionic emission and contact electricity. It shows that there is a close connection between these last two properties of matter and that both are related to the modern quantum theory. Moreover, calling the "threshold frequency" that lowest observed frequency of light, incident upon a metallic surface, which causes electrons to be disengaged therefrom, then the maximum kinetic energy of such electrons is found to be equal to Planck's constant multiplied by the excess of the actual incident light frequency over the threshold frequency. These relations strongly oppose the chemical theory of contact difference of potential between metals, concerning which so much literature has accumulated since Volta's epoch-making discovery.

Electrical questions are likely to arise in any of the sections, but they are due for presentation either in Section A of physics, or in Section G of engineering. The papers in Section A this year were largely occupied with theories of the internal structure of atoms. The trend of opinion is toward the existence of a central positive atomic nucleus and of a number of negative electrons revolving about this nucleus in extremely minute planetary orbits at enormous angular velocities, each atom being thus a microcosmic solar system. On the other hand, others are content to assume the same central positive nucleus, with the same negative electrons attracted toward the central sun electrically, but also repelled therefrom by some independent force taking the place of centrifugal force. Under such assumptions the electron satellites will not describe orbits, but will merely group themselves statically at appropriate equilibrium distances around their sun, so that, if disturbed, they will pulsate to and fro in radial straight lines, with the same frequencies as the orbital philosophers predict. These two concepts, of a dynamic and a static atom respectively, are presented for future measurements to select or modify.

The presidential address in Section G—engineering—is entitled "Notes on Water-Power Development," by Prof. A. H. Gibson. This is a review of the recent hydro-electric development in various countries throughout the world. A conclusion would be that, despite rapid modern developments, there remains in all countries a large amount of available water power as yet wasted. Among the papers on electrical subjects was one by John Scott-Taggart, on "Two New Negative Resistance Devices for Use in Wireless Telegraphy." Both are electron tubes, operated in such a manner as to develop negative resistances, equivalent to emfs., in the circuits to which they are applied. One employs a pair of triode tubes and the other a special tetrode tube.

Among the exhibits was a "recording ultra-micrometer," shown in operation by J. J. Dowling. It consists essentially of a triode oscillator connected to an oscillation circuit of condenser and inductance in one of the regular systems for exciting sustained oscillations of, say, 500 kilocycles per second. The plate circuit contains a reflecting galvanometer ingeniously adjusted to give a zero deflection upon a steady flow of plate current. The small oscillation condenser is adjusted to give resonant oscillation when the plates are separated by an air gap of about one-third of a millimeter. In such a condition the strength of current in the plate circuit varies very rapidly as the capacitance of the condenser departs from the value of resonant excitation

so that extraordinarily minute changes in the air-gap distance of the condenser, such as a millimicron, become detectable in a departure of the galvanometer index from its zero. Various applications of this principle were shown, depending upon minute changes in the air gap of the oscillatory condenser. It is stated that the decrease in weight of a kilogram mass when lifted one meter could be detected in this way. We rarely visualize to our mind's eyes the reduction of gravitation occurring between table level and floor level.

Another interesting exhibit, applicable to electromagnetic-wave analysis, was a mechanical device by W. L. Balls for detecting the harmonics in a complex wave form. A number of threads, actually eighteen, were strung from a common center, fan-wise, in a horizontal plane, at uniform small angular distances, each terminating at the free end in a small weight hung over a pulley. The wave form to be analyzed is cut out in cardboard, and this template has its edge smoothed with wax. The smoothed edge is then advanced under the threads, and in contact with them, in such a manner that the center is lifted rhythmically, as shown by a mirror and long-range light spot. The template has to be applied by trial at the radial distances along the threads, to reveal the fundamental and also a few of the lowest harmonics. The method avoids the use of arithmetic in revealing the presence of such harmonics, but some use of arithmetic becomes necessary in determining the amplitude of such harmonics as may be revealed.

The meetings, which lasted from Sept. 7 to Sept. 14, were well attended, the total registration having exceeded 2,700, which is the largest since the world war. A number of entertainments were provided for the visitors. Among these was a reception by the Mayor of Edinburgh, who goes by the title of the Lord Provost, at the Royal Scottish Museum, which, incidentally, is second only to the British Museum at London in wealth of collections and in the attractiveness of their display. The Provost and officers of the corporation, in their scarlet robes, receiving a long line of guests attended by halberdiers, against a background of classic antiquities, might well revive a medieval scene but for the modern attire of the hand-shaking oncomers.

The association usually meets at some city in Great Britain, but meetings have been held in Canada, Australia and South Africa. Invitations to hold a meeting are entertained two years in advance, in order to enable adequate preparations to be made. Rumor has it that the ninetieth and next year's meeting is to be held in the city of Hull.

An interesting lecture on Einstein's theory of relativity was given by Prof. A. S. Eddington, who is a leading British exponent of that new and much-debated philosophy. The lecturer briefly reviewed the famous Michelson-Morley experiment and accounted for its negative result by the contraction of the length of a bar held in the direction of the earth's motion, owing to electronic forces. This showed that length is not an absolute property of matter, after correcting for its temperature and pressure. Length and distance must be acknowledged to be relative quantities, 'strictly speaking; *i.e.*, relative to the velocity of the environment. As a further consequence of these conditions, time cannot be left out of account when discussing space relations. Time is necessarily involved, in a particular way, with the three dimensions of space, to make up a four-dimensional continuum. This led to the inference of non-Euclidian geometry in control of phenomena near matter. In the absence of matter, the phenomena of space might appear to belong to the classical three-dimensional geometry of Euclid, but in the neighborhood of matter space underwent a pucker or deformation which we are accustomed to interpret as a gravitational field of force. The lecture regarded the astronomical observations obtained during the solar eclipse of 1919 as virtually supporting the conclusion that in the neighborhood of the sun space deviates slightly from the Euclidian type. Further corroboration of the Einstein relativity theory had been revealed in the otherwise unexplained progressive motion of the line of apsides in the orbit of the planet Mercury. The theory also called for a small change in the waves of light emitted from the incandescent surface of the sun, as compared with light emitted from incandescent bodies on the earth. It was as yet doubtful whether this difference had been detected and this third corroboration secured, but, at least, the probability of its existence appeared to be increasing.

At the close of the lecture a few remarks were made by Professor Kapteyn from the astronomical standpoint, and by Dr. Oliver Lodge from the physicist's standpoint. Professor Kapteyn pointed out the difficulties which the ordinary trained mind encounters in apprehending or visualizing the Einstein four-dimensional time-space, but he considered that just as Copernicus had laid the scientific world under indebtedness by forcing scientists to shift their viewpoint of the universe from the geocentric to the heliocentric basis, so Einstein had contributed to our enlightenment by shifting the concept of velocity from an absolute to a relative basis. Dr. Lodge paid tribute to the zeal with which Professor Eddington had made Einstein's doctrines generally known in Great Britain. He regarded the ether as fixed and matter as having the property of motion through the ether. Neither Einstein nor Professor Eddington denied the existence of the ether; they merely deduced certain new properties affecting it. While he believed that the views of the physicists and the astronomers were coming to differ less and less from those of Einstein and Eddington, there were still outstanding differences. In particular, geometrical measurements belonged to the domain of physics.

A. E. KENNELLY.

Paris, France.

[Dr. Kennelly, who for the current college year is on leave of absence from Harvard University and the Massachusetts Institute of Technology, is serving as the first exchange professor of engineering subjects to France.—EDITORS.]

Arc Rupture in Magnetic Blowout Switches

To the Editors of the ELECTRICAL WORLD:

In my article on "Arc Rupture in Magnetic Blowout Switches," published in the Sept. 3 issue of the ELECTRICAL WORLD, page 461, I note a number of typographical errors. The curve shown for Fig. 3 should have accompanied the caption for Fig. 7 and vice versa. The caption for Fig. 5 should have read "in Figs. 4 and 6," instead of "in Figs. 3 and 4." This interchange of illustrations is unfortunate as it confuses the subject matter. Also there are two "Fig. 7s" in the article as published.

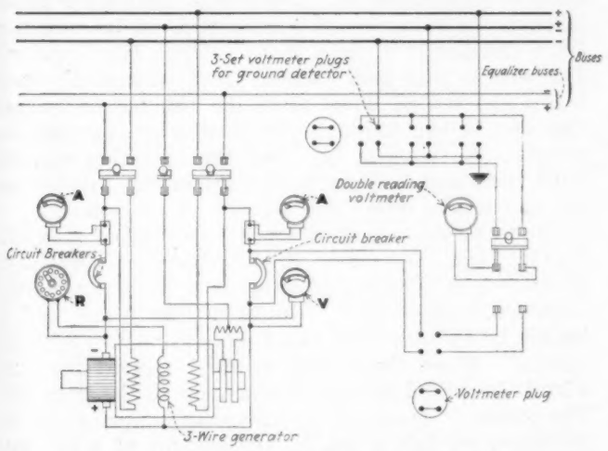
O. H. ESCHHOLZ,
Material and Process Engineering Department,
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Paralleling Three-Wire Direct-Current Generators

THE protection of three-wire double-voltage generators involves factors which may be best understood by consideration of the special features of this class of apparatus which differentiate it from the ordinary two-wire generator. It is characteristic of



INTERLOCKED CIRCUIT BREAKER INSERTED BETWEEN BRUSHES AND EQUALIZER BUSES

this type of generator that its field winding must be compounded from both positive and negative leads; hence when operated in parallel two equalizer connections are required, thus making a total of five main buses connecting each generator. These connections are indicated in the accompanying diagram.

To provide adequate protection the circuit breakers must be connected between the machine brushes and the equalizers in order that its tripping elements may be actuated by the full armature current and thus fulfill the functions of the device. The two single-pole breakers on the positive and negative leads must be interlocked; otherwise should only one breaker open the compensator for deriving the neutral would have to carry the full armature current and would probably be damaged. If placed between the series field and the busbars the device should be actuated by a current sometimes greater and at other times less than the armature current, depending upon the direction upon which the equalizing current is being exchanged between the machines. The equalizers are at the full terminal potential, and unless the voltage of an incoming machine is fully built up before it is paralleled with the machine running a violent short circuit is likely to occur in the armature of the incoming machine. For this reason switching equipments should be such that the series field will be thrown in circuit before a generator is paralleled.

Owing to the fact that unusual care must be exercised when paralleling three-wire direct-current generators it is advisable that a voltmeter be connected as shown in the diagram to reduce the likelihood of any accident. When paralleling, as already mentioned, the series fields of the incoming machines are connected first, then the two single-pole breakers are closed one at a time. By connecting a double-reading voltmeter (*i.e.*, a meter with a zero center) across the last circuit breaker an indication would be obtained if any short circuit existed on the incoming machine, also if the voltage of this machine was too high or too low for paralleling. In connection with this voltmeter connection if a double-pole, double-throw switch is inserted in the voltmeter circuit and connected through three voltmeter plugs, a very good ground detector is afforded.

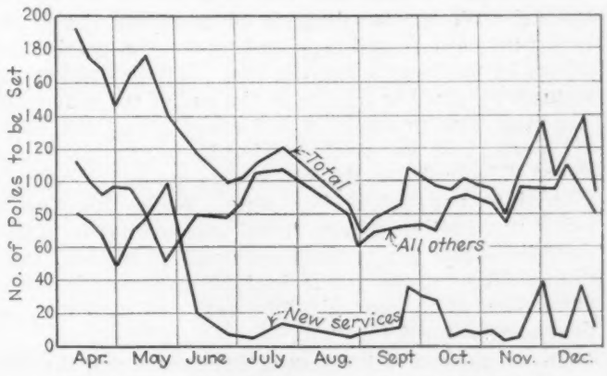
R. H. N. LOCKYER.

Bonnington Falls, British Columbia.

Graphic Records Show How Work of Setting Poles Is Progressing

TO SEE clearly at all times how the work of setting poles is keeping up with the number of orders on hand, graphic curve sheets are plotted from the weekly records of the Worcester (Mass.) Electric Light Company. These curves show the number of incompleted orders on hand for setting poles. If the curves rise at too great a rate, it shows that the forces are not able to handle the jobs fast enough. The forces are then increased or men are taken off other jobs to help in catching up with the work. Three curves are plotted, to show the total number of poles, the poles to be set for new services and the poles for other uses respectively.

Curves of this sort have proved a valuable aid to the



THE CURVES SHOW THE NUMBER OF POLES TO BE SET FROM WEEK TO WEEK

management of the distribution department in this company. Other examples have been given in previous issues of the ELECTRICAL WORLD.

GEORGE M. HARDY,
Superintendent.

Worcester Electric Light Co.,
Worcester, Mass.

Running a Long Span Wire Over Rough Water

WHERE it is necessary to maintain wire communication over a stormy channel having strong currents and a rocky bottom, elevated span wires must be utilized instead of submarine cables. The maintenance of wire communication between Tatoosh Island and Cape Flattery presents one of the most difficult problems of this kind. The distance from the island to the mainland is about three-quarters of a mile. As the channel has extremely strong currents, and as high winds prevail during the winter and the bottom is rocky, any attempt to run a cable on the bottom would result in its chafing through within a short time.

In stringing the span, allowance for high tide and high masts must be made so as to permit a vessel to pass beneath the wire. Even if the land is sufficiently high, some form of tower is necessary as a support. The wire must be heavily galvanized to prevent corrosion from the salt air. For long spans, as at Tatoosh, the towers should be of steel securely bolted to heavy concrete foundations. There is a grooved porcelain insulator block on the top over which the wire is led. Directly in line and to the rear a heavy concrete anchor is placed to carry the weight of the span. This is accomplished by means of a galvanized chain shackled to the eyebolt in the anchor and connected to the wire through an electrose or other heavy strain insulator.

The running of the wire presents no great difficulty under circumstances where the bottom is smooth enough to permit direct hauling or laying, but at Tatoosh the bottom is so rocky that the wire has never touched bottom without being lost. The problem then is to get the wire across three-quarters of a mile of stormy cross currents without touching bottom. This is accomplished by means of empty 5-gal. oil cans.

First all towers and anchor supports are placed in readiness. The span wire itself is on a reel in the rear of the Cape Flattery anchor, and the reel has a powerful brake to prevent the wire taking charge. An eye is spliced in the free end of the wire. A power boat is in readiness off shore with a fifteen-thread dry manila line coiled free for running. The line must be dry and new enough to float and long enough to bridge the channel. When everything is in readiness the power boat runs close to the cape and passes the manila line ashore by means of a heaving line. This is quickly and securely fastened to the eye in the end of the span wire. The boat now proceeds at full speed across the channel, paying out the manila line but keeping a fair strain on it. The brake on the reel is kept set and no wire is allowed to run out at this time. While this line is being run another fifteen-thread manila line is passed from the island to a rowboat anchored off in water sufficiently deep for the power boat to maneuver in. The power boat runs alongside this small boat and the two lines are fastened together.

The island end of the manila line is now run through a snatch block on the top of the tower. A small boat with an Indian boatman has in the meantime been anchored near the cape end of the line about 30 ft. from shore and directly under the manila line which passes through a fair lead large enough to take the eye splice. This boat has about twelve empty 5-gal oil cans which are securely sealed. The island end of the line is manned by eight men, and at a signal from shore they heave it in through the snatch block on the top of the tower. As the eye splice passes through the fair lead the Indian in the boat securely fastens on a 5-gal. can. Other cans are fastened approximately every 400 ft. These cans keep the wire on the surface or near the surface and prevent it being cut by the jagged rocks on the bottom. A fair strain is kept on the wire by the reel brake. During the running of the wire the power boat patrols to clear any obstruction and to warn any approaching boats to keep clear. Signals are arranged to enable the hauling party on the island to call for more slack or more strain. After the eye splice is hauled through the snatch block in the top of the island tower enough wire is taken through to provide sufficient end for splicing and the reel tender holds fast.

The reel end is spliced into the insulator by means of a large thimble. This thimble is attached to the insulator, which is held by the chain, and the chain is in turn shackled to the ring bolt in the anchor. This splice is very important. The end of the wire is passed through the thimble and wound back on its own part for a distance of at least 2 ft., using a long open roll. The wire is then bent back on itself without too short a nip and wound down until the thimble is reached. The end is run through the thimble in the opposite direction to the first tuck and the operation repeated until there are four parts of wire in the thimble and the end wound down and secured at the top.

The whole splice must now be securely taped over with friction tape. On top of this it receives several coats of white lead, zinc and oil paint as a protection against corrosion. This splice completed, the other end is hauled in by means of two pairs of lineman's "come-alongs." When the proper strain is placed upon the wire it is spliced in a similar manner to the shore end. The strain is measured by means of a spring tension indicator, or, better yet, by the amount of sag. Both ends of the span being fast the aerial wire is spliced thereto at each end.

FRANK LUCKEL,
Lieutenant Commander, U. S. N.
Navy Yard, Puget Sound, Wash.

Boltless Clamp for Guy Wires

A ONE-PIECE boltless guy clamp is now coming into use by a number of central stations for guying poles, splicing messenger wires, etc., in the same way that the ordinary three-bolt clamp is used. The Postal Telegraph Company has had several thousands of these clamps in service for about a year, giving them a thorough practical test. The particular features of the clamp are that it can be applied in less time than is required for a three-bolt clamp and once it is put into service it will hold the guy wire without slipping up to the full breaking strength of the wire. Only two or three minutes is required for attaching the clamp.

The wire is woven around the projections on the

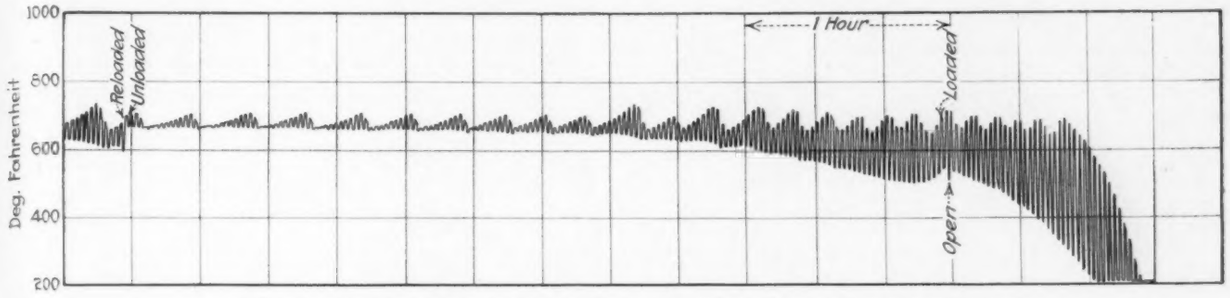
GUY-WIRE CLAMP REQUIRES NO BOLTS

clamp as shown in the accompanying illustration, and when the tension is put upon the line the wire is tightened in the clamp and cannot slip or come off the clamp. A tool in the shape of a wrench is used for applying the clamp when the wire is under tension.

Shull Boltless Clamp Corporation, F. G. SHULL,
Niagara Falls, N. Y. President.

Electric Furnace Gives Excellent Results in Bluing Metal

BLUING metallic parts by heating is an art to which the accurate control of electric heating has been successfully applied in an experimental furnace recently built. In such work a temperature varying not over 5 deg. Fahr. must be maintained in all parts of the oven where the work is placed. It is necessary to place the work in the oven at a moderate temperature and raise the whole slowly up to the bluing point. The temperature must then be held constant during a certain period of time. About 590 deg. Fahr. is used for most work.



STEADY TEMPERATURE HELD BY ELECTRIC FURNACE FOR BLUING METAL PARTS

With gas fuel the temperature as measured was held at 650 deg. Fahr. The same results are obtainable in the electric furnace with a lower average temperature. One reason for this is that no ventilation is required and therefore heating is more uniform than in the gas-fired furnace and there are no cold spots of which the temperature must be raised by raising the average temperature.

A bone charge to give off smoke for the bluing process is placed in the bluing drum after the furnace has been brought up to a temperature of 450 deg. to 500 deg. Fahr. After this smokes freely the rack is placed in a rotating drum and allowed to roll about in the bottom. It was firmly believed that by means of an electric furnace a great many of the variable factors met with in the gas furnace could be done away with and a standard cycle of operation for each type and size of work established which could be repeated day in and day out.

The experimental furnace consists of an American Gas Furnace Company drum mounted in a Crawford sectional oven having heavily insulated walls. General Electric heating units were placed in the bottom of the furnace directly beneath the drum. There is a General Electric control panel equipped with a Leeds & Northrup potentiometer control. Three thermocouples allow the temperature of both the front and rear of the drum as well as the temperature directly above the heating units to be read at will. Various controls were tried and the one-point control from the thermocouple at the heating units was found most desirable.

The two drum thermocouples were first placed in a hollow steel shaft extending through the drum, but they were found to register the work temperature inaccurately owing to the slow absorption of heat by the shaft and the slow falling off of temperature when the heat dropped. This objection was rectified by suspending the thermocouples along the top of the drum where they were fully exposed.

The first trials showed that there was a loss of heat through the front of the oven around the rotating drum which caused a rather large temperature gradient from back to front in the oven. A redistribution of the heating elements failed to overcome the difficulty mainly because when the current was off the loss was still present. The logical solution seemed to be separate units which should be run continually and compensate at all times for this heat loss. Units of 4-kw. capacity were consequently installed and operated continually in conjunction with the 16-kw. units originally installed. This gave the desired results, as will be seen by a study of the chart.

A variety of work has been tried on this experimental oven. It is firmly believed that from experience a heat cycle can be determined which may be repeated without fail.

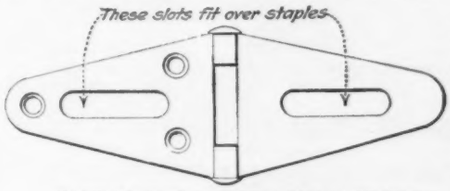
Bakes have been run at the rate of only two per day. The oven requires 30 kw-hr. for heating up from cold, but will turn out a five-hour bake of 50 lb. to 100 lb. with an additional consumption of 20 kw.-hr. to 25 kw.-hr.

This thermal efficiency of the oven can be greatly improved and the consumption of power energy reduced to a point where it can compete with gas. The economy, however, is of secondary importance so long as successful bluing can be assured. Certain it is that the variable factors have been cut to a minimum and experiments point to a fair higher average of successful work being done than ever before.

Hartford Electric Light Company, Hartford, Conn. H. W. DERRY, Power Engineer.

Double Hasp Allows Separate Locks for Joint Property

WHEN a transformer or meter house is installed on the property of an industrial consumer it frequently happens that the consumer wants a key to it. If the utility has a standard lock for transformer houses and the consumer has a line of standard locks for the different departments, friction is liable to develop over the question as to whose lock shall go on the door. To overcome this an Eastern utility uses a home-made double hasp. It consists of the ordinary hasp with a slot cut in what is normally the stationary side, as shown in the illustration. In this way each party puts on his own lock, two staples being provided, and since



EACH SLOT IS SLIPPED OVER A STAPLE AND A PADLOCK IS INSERTED

one lock is always in place the hasp is held in the same way as if it were fastened with screws on the locked side. When used with double doors one staple is placed in each door, bringing the hinge over the crack between them. With a single door one staple is placed in the jamb and the other in the door. D. A. MCNULTY.

Waterbury, Conn.

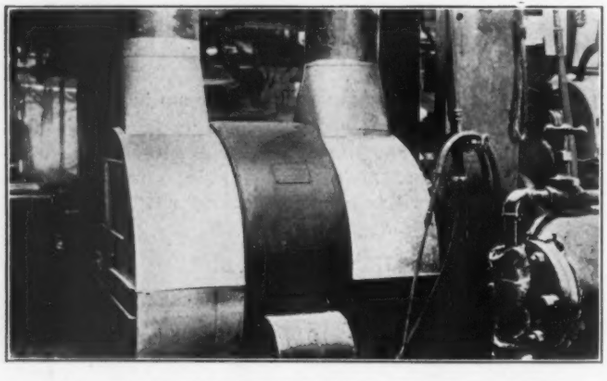
Wires Kept from Twisting When Pulling in Conduit

WHEN running a large number of small wires through conduit it is often difficult to keep them from twisting and crossing inside the pipe. In order to keep the wires straight under such conditions the writer makes use of a fiber guide through which the wires are fed at the entrance to the conduit. This guide consists of a piece of fiber about ¼ in. thick in which holes slightly larger than the size of wire to be run are drilled. There is one hole for each wire. The wires are passed through the holes and then twisted together and pulled through the conduit. The fiber guide is held a little distance away from the conduit if the number of wires is great compared with the size of the conduit so that the wires will not enter at a sharp angle. As the wires are pulled they are kept separate as they enter the guide, all twists and tangles being taken out before they reach the guide. With this arrangement about the only difficulty that can be experienced is that the whole mass of wires may twist spirally.

New York, N. Y. W. A. HARRIS.

Motor Housing Prevents Dust Collection and Improves Ventilation

PROPER ventilation and elimination of dust become very important factors in the operation of large heavy-duty motors such as are found in sawmills and other dusty places. The illustration shows a 400-hp., 900-r.p.m. motor directly connected to an edger in the mill of the Inman Poulsen Lumber Company at Portland, Ore. An airtight, sheet-iron housing has been placed on each end of the motor, and each of these housings is tapped by an 8-in. pipe leading to the outside of



ONLY CLEAN, COOL AIR PASSES THROUGH THIS MOTOR

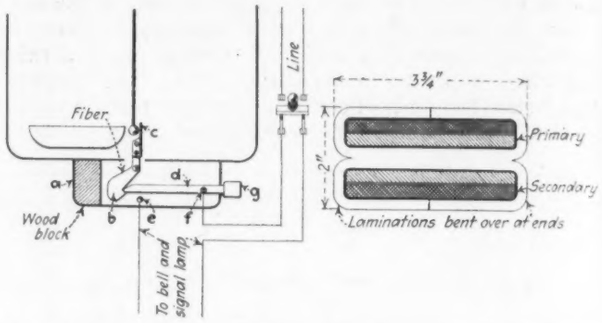
the building. The housing keeps all dust away from the motor, and the fan blades on the rotor cause a circulation of cool, clean air through it. Sliding doors are provided in each housing opposite the bearings on motor for oiling and inspection. W. C. HESTON,

Industrial Engineer.

Portland (Ore.) Railway, Light & Power Company.

Loud Telephone Signal for Mill and Factory

IN MANY places in mill and factory difficulty is experienced in hearing the telephone bell, due to noise, distance from the instrument, etc. Since the ordinary extension bell often proves unsatisfactory, a simple arrangement is here shown that solves the difficulty and also insures continuous alarm until the call is answered and the signal reset.



LOUD SIGNAL ATTACHMENT FOR TELEPHONE IN A NOISY PLANT

Left—Relay mounted in telephone box. Right—Transformer for reducing voltage on bell and signal lamp. The laminated core has a cross section 0.4 deep by 1 in. wide. Wiring is as follows:

Turns	Primary Size Wire	Volts
2,200	40	110
	Secondary	
80	26	4
120	26	6
160	26	8

A wood block *a* about 1⅜ in. by 3¾ in. in size is slotted (5/16 in. wide) as shown in the cut. A piece of ⅛-in. fiber *b* is formed with a piece of thin sheet steel *c* extending upward so that the vibrating bell clapper will strike it (one bell having been removed). The latch *d* is made of ¼-in. square or round copper or brass with the end *g* insulated to serve as a resetting handle. At *e* and *f* are copper or brass pins extending through the wood block and slot and serving as contacts to which the line is attached. An ordinary house bell in combination with a signal lamp has been found very satisfactory for connecting to the other end of the circuit to give the alarm.

An easily and cheaply made transformer to operate the bell from a 110-volt circuit is shown at the right. The iron is cut in strips 1 in. by 12 in. in size and the coils are wound directly on the iron, the ends being then turned back and lapped as shown in the drawing.

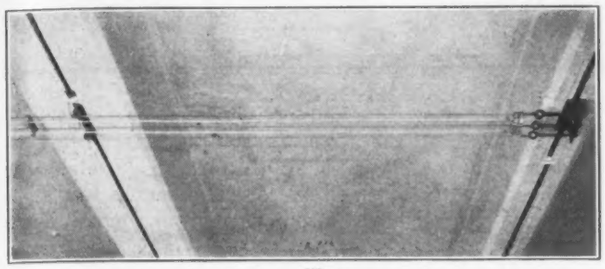
Truscon Steel Company, R. H. POOL,

Youngstown, Ohio. Assistant Electrical Engineer.

Open Wiring Permits Quick Relocation of Factory Lamps

TO ENABLE lamps to be easily relocated in the factory and offices of the American Bosch Magneto Corporation, Springfield, Mass., the open type of wiring illustrated herewith is used. The circuits are of No. 12 copper, insulated with fire-resistant covering, and carried by porcelain cleats supported by two parallel No. 10 steel messenger wires fastened to beam clamps at intermediate points and to eyebolts at the ends of spans. Two parallel steel guard wires are also run just below the conductors. The intermediate attachments of the messenger wires are 1¼ in. wide by ⅛ in. thick and are bent at the ends to clamp the steel wires in position.

The tops of the porcelain cleats are capped by ½-in. x 2¾-in. x ⅛-in. flat bars, and the strain terminals at the ends of the spans are fastened to 2½-in. x 2½-in. x 1.4-in. angles by four ⅜-in. eyebolts. Attachment to the concrete beams is by ⅝-in. bolts seated in slots provided in the lower beam surface. Spans 8 ft. to 10 ft. long are easily installed, and the relocation of taps for lamps or drop services is a matter of a few moments.



POSITION OF LAMPS EASILY CHANGED ON THIS WIRING

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Conditions that Should Be Watched When Dipping and Baking Armatures

OBSERVATIONS on armature dipping and baking made by E. C. Parham in the July 16 issue of the ELECTRICAL WORLD prompt the writer to bring out a few points aimed at preventing wrong conclusions from some of the results recorded. It is true that satisfactory results can be obtained without careful checking to maintain constant baking temperatures, definite specific gravity and uniform length of bake, but to get the best results these points must be watched. All the advantages claimed are true, especially where old armatures are being overhauled.

The statement that the amount of ventilation did not affect the length of time required to bring an armature to a definite resistance may be taken as an argument that a good supply of air is not required. This, however, is not the case, since the better grades of insulating varnish depend upon oxidation for drying and this can only be accomplished by having a good circulation of air. The length of time required to bring the insulation to a definite value does not depend entirely on the drying of the varnish, but rather on driving off the moisture and solvent and slight natural ventilation will do this.

Insulating varnish in itself has a rather high resistance, so it is readily seen that the required resistance may be obtained without the varnish drying to the desired degree.

The conclusions might be drawn from the results obtained with different temperatures that a low one will dry out an armature just as well and as quickly as a higher one. The results which seem to indicate such a condition can be explained by the effect of temperature on insulation resistance. Insulation resistance is very sensitive as regards temperature, and an armature may be drier at a high temperature with a low resistance than with a higher resistance at a lower temperature. No doubt the armatures at the higher temperature were drier for the same length of bake than the others, although the resistance was lower. The same is true in the case of transferring armatures to a higher temperature oven, for as the temperature of the armatures rose the insulation resistance fell. This great change in insulation resistance with temperature can best be illustrated by taking the insulation resistance hot, and again after the armature has reached room temperature. The writer recently observed an armature having an insulation resistance of 1 megohm to 2 megohms at approximately 110 deg. C. which increased in resistance to about 2,500 megohms when cooled to room temperature.

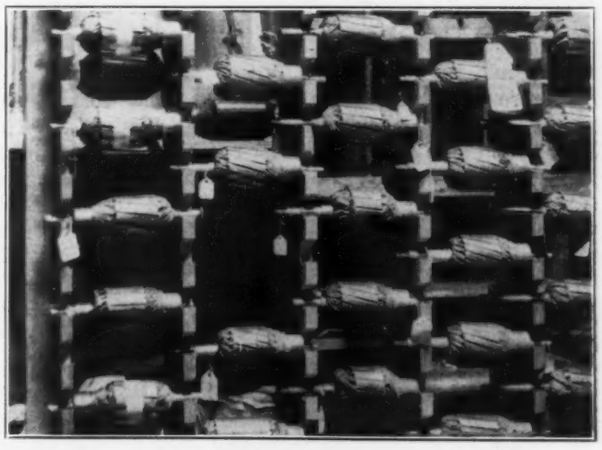
It is difficult to determine just how dry an armature should be before dipping. Any moisture remaining is driven off much more slowly after the armature is dipped, and consequently if an armature is dipped before it is sufficiently dry, enough moisture may be trapped in the armature to give trouble if concentrated at one point. For this reason baking out the armature thoroughly before dipping is advisable.

From the points brought out it is clearly seen that to obtain the best product the condition of the armature before dipping, the temperature of baking, the specific gravity of the varnish, the circulation of air and the length of baking must be watched; but a considerable range may be allowed and good results still be obtained. That dipping and baking will take a prominent place in the maintenance of railway motors in the future is assured, as all companies that have given the process a trial are convinced that it pays.

I. B. STEIFEL,
Railway and Motor Engineering Department.
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

Over Six Hundred Armatures Stored in Small Space

TO STORE compactly and yet accessibly the armatures of small motors of automobile lighting sets the New Haven (Conn.) Electric Company uses the home-made rack of which a section is shown in the accompanying illustration. The rack is built of ¾-in. pine strips in which holes 1¼ in. in diameter were drilled near the edges on each side of the strip. The stock between the outer edge of each hole and the edge of the wooden strip was then sawed away on an angle of about 15 deg. from the horizontal, forming a series of slots with circular backs and bottoms about 1½ in. deep and 2¾ in. apart by vertical center-to-center measurement.



RACK 12 FT. LONG AND 7 FT. HIGH HOLDS 784 ARMATURES

The rack strips of ¾-in. stock are set parallel 6½ in. apart horizontally. In a space 12 ft. long and 7 ft. high, using a double rack (front and rear) the company stores 784 armatures, every one within easy reach of a person of ordinary height when standing on the floor.

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Boston Edison Abandons Merchandising Where Dealers Are Competent

THE BOSTON Edison Company has taken still another step in the development of closer co-operation between the central station company and the contractor-dealer. The new policy embodies noth-

BOSTON EDISON COMPANY'S OFFICE AND CONTRACTOR DEALER'S STORE SIDE BY SIDE IN WINCHESTER

ing less than the withdrawal of the company from the direct sale of electrical merchandise in territory where the nearby contractor-dealer shows himself competent to promote appliance sales enthusiastically and efficiently. With it goes all of the company's influence to advance the sale of electrical products.

About six months ago the company decided to see what could be done in the Boston Edison territory to get more contractors to sell appliances and work on the so-called fixed-schedule house-wiring business. The first actual step toward turning over appliance business to contractors has been taken in the town of Winchester, 8 miles north of Boston. An electrical contractor, E. B. Sanderson, opened a fine appliance store next door to the Edison company's Northern District office. No appliances are displayed in the Edison company's office in view of the fact that the contractor-dealer's store is next door, but inquiries for appliances are courteously referred to the contractor-dealer.

Winchester had been selected as the first town because this contractor proved his ability, efficiency and reliability as a business man who was willing to co-operate with the company. Fifteen years ago he was what is generally termed a small contractor, but he established a reputation for constructive co-operating. Eight years or more ago, when the company through its sales department established a definite schedule for house wiring, Mr. Sanderson was quick to see its possibilities.

He went after the house-wiring business energetically, though at the time many other electrical contractors felt that they couldn't afford to do wiring on the Boston Edison schedule. Mr. Sanderson has made money on the so-called Edison contract, and today he has between forty and fifty men working on house wiring. Negotiations are under way for similar co-operation with the shops of other electrical contractors in other sections of the more than 600 square miles of territory that the Boston Edison Company serves.

Contrast of Old and New Makes Interesting Window Feature

CONTRASTING modern electrical equipment with similar apparatus of obsolete type affords the central-station company many good opportunities for window trims or salesroom exhibits which will bring home to customers and the public the rapid strides that have been made in the development of the electrical art and what it means to the public welfare. The first dynamo operated in Louisville, Ky., was recently used in an interesting display of this kind in the office of the Louisville Gas & Electric Company, linked with the portraits of Thomas A. Edison and Col. H. M. Byllesby. The same thing has been done effectively where the utility company has borrowed the oldest washing machine in town and displayed it in contrast with the latest model, a prominent card telling what Mrs. Brown thinks of this old machine of hers. Similar displays can be made with old and new lighting fixtures, electric signs, flatirons, motors, switches or any other piece of apparatus that offers a spectacular comparison.

TYPE OF DISPLAY WHICH DEPICTS PROGRESS OF ELECTRICAL ART

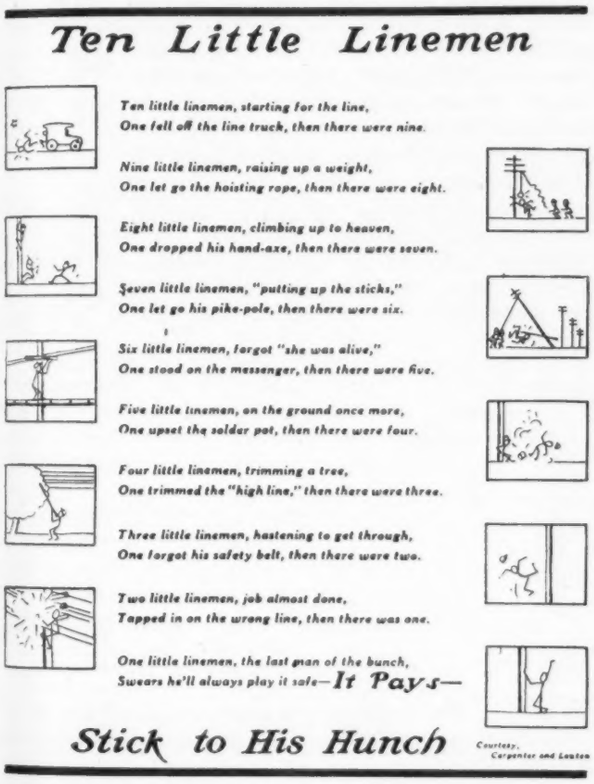
Columbia Offers Course in Study of Electrical Appliances

OPPORTUNITY for the systematic study of electrical household appliances and heating devices will be offered at Columbia University, New York City, this winter in the physics laboratory of Teachers' College. The course will be on "Household Mechanical Appliances," and will be given by F. F. Good. Practical ex-

periments will be conducted on vacuum cleaners, flatirons, toasters, immersion heaters, sewing machines and motors. These experiments are intended to provide practice in mechanical skill, study of the principles of operation, diagnosing and correcting troubles and selection and cost of apparatus.

"Safety First" Poster Carries Clever Appeal

TO GET the "safety first" idea across is not the easiest thing in the world. The accompanying poster is particularly effective for it carries a serious message in an interesting manner and draws an object


Ten Little Linemen
Ten little linemen, starting for the line,
One fell off the line truck, then there were nine.
Nine little linemen, raising up a weight,
One let go the hoisting rope, then there were eight.
Eight little linemen, climbing up to heaven,
One dropped his hand-axe, then there were seven.
Seven little linemen, "putting up the sticks,"
One let go his pike-pole, then there were six.
Six little linemen, forgot "she was alive,"
One stood on the messenger, then there were five.
Five little linemen, on the ground once more,
One upset the solder pot, then there were four.
Four little linemen, trimming a tree,
One trimmed the "high line," then there were three.
Three little linemen, hastening to get through,
One forgot his safety belt, then there were two.
Two little linemen, job almost done,
Tapped in on the wrong line, then there was one.
One little linemen, the last man of the bunch,
Swears he'll always play it safe—It Pays—
Stick to His Hunch
Courtesy, Carpenter and Lauten

AN INTERESTING "SAFETY FIRST" POSTER

lesson that can be easily visualized by the reader. The poster appeared in a recent issue of the Safety Bureau's *Bulletin*.

Minneapolis Company Interviewed 35,540 Persons in August

IN CONNECTION with the volume of business transacted by the Minneapolis General Electric Company during the month of August, which was the busiest in the history of the company, a record was kept of

	People Interviewed in Person	People Interviewed by Telephone	Total
Information bureau	2,600	.....	2,600
Contract	7,500	2,600	10,100
Appliance department	3,500	520	4,020
Range department	7,500	2,600	10,100
Power department	650	1,000	1,650
Housewiring department	1,400	1,100	2,500
Suburban department	560	760	1,320
Sales manager's office	650	2,600	3,250
	24,360	11,180	35,540

the number of interviews which the sales department had with the public. Both personal and telephone interviews totaled 35,540. They were divided among various branches of the department, as shown above.

What Other Companies Are Doing

Pueblo, Cal.—With 5¼ miles of "white-way" system just completed in its business and residential sections this city claims a record for ornamental street lighting in cities of 50,000 population. There are three types of standards. In the business district, covering 1¾ miles, Corinthian standards are used, arranged eight to the block, four on each side of the street. Ornamental five-light posts are used on 2¼ miles of streets and through several blocks of the residence district. Single-light posts cover 1¼ miles of the residence district. The three types are divided as follows: 155 Corinthian standards, one 100-watt and four 60-watt multiple lamps; forty-three five-light posts, one 100-cp. and four 80-cp. series lamps, and 66 one-light posts, one 100-cp. series lamp. That portion of the system which was built before the flood last June withstood the strain remarkably well.

Philadelphia.—A valuable service to women's clubs, improvement societies, neighborhood and business men's organizations, churches and the like is being offered by the Philadelphia Electric Company in the form of an illustrated lecture with slides or "movies," or an informal talk on the subject of household efficiency and the electrical equipment of the home. The service is offered without charge and has no commercial feature or connection. The company is calling the attention of women's clubs that are making up their fall and winter programs to this service. Already talks have been made before half a dozen prominent organizations in the nature of informal discussions on up-to-date housekeeping and the part electricity plays in it.

Omaha, Neb.—"Don't let up advertising in newspapers or anywhere else because you feel that times are hard. That is the time to advertise," said J. E. Davidson, general manager of the Nebraska Power Company, in an address before a recent meeting of power and light company operators in Omaha. "When business is slow advertising will stimulate it. Cut down expenses but leave your advertising appropriation intact. Tell the citizens of your community about your business."

Norristown, Pa.—Employees of the Counties Gas & Electric Company, a subsidiary of the United Gas Improvement Company, subscribed 100 per cent to a stock offering recently made by the company. The stock was 8 per cent cumulative, preferred, and a customer-ownership campaign is to be opened immediately by the Counties company.

New England.—Returns for the first half of 1921 compiled by Charles H. Tenney & Company, Boston, show encouraging gains in business for the public utilities affiliated with this organization. Eleven electric light and power companies gained 6.53 per cent in lighting customers, 6.38 per cent in power customers and 14.05 per cent in electric heating customers. The totals on July 1 were, respectively, 71,706, 3,267 and 414. Notwithstanding the depressed conditions of the first half of this year there was a gain in connected horsepower in motors of 1.98 per cent, bringing the total connected power load of the eleven companies on July 1 to 88,304 hp. Cyrus Barnes is new-business manager and V. M. F. Tallman power engineer of the company.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Present Status of Electric Machinery.—F. FLEISCHMANN.—At a recent meeting of the German Electrotechnical Association the author presented a paper on the latest developments of large electric machinery, and this article is an abstract of the paper. It is, therefore, obvious that the article contains in a very condensed form such an abundance of data and experiences that it is impossible to make a further abstract of it that would have any value. A large number of photographs accompany the paper, which in themselves will be of great value to any designer of motors and generators. The author deals with generators, high-frequency generators, motor-generators, rotaries, rolling-mill motors, railway motors and transformers. All of the machinery is of A. E. G. design. The important subject of heating and ventilating large machines is treated extensively.—*Elektrotechnische Zeitschrift,* Sept. 1 and 8, 1921.

Lamps and Lighting

Street-Car Lighting.—J. A. SUMMERS.—A discussion of the proper lighting intensities, taking into consideration the interior finish of the car, the voltage regulation, arrangement of seats, the standard of lighting in the community and the value of lighting from the standpoint of making car signs attractive. This paper discusses these points and mentions that there is a strong tendency to go to at least 10 foot-candles of intensity, which can be procured with an expenditure of about 2 watts per square foot of floor area. In all cases medium-density open reflectors are recommended, and they should be placed not over 5 ft. apart.—*Transactions of Illuminating Engineering Society,* July 20, 1921.

Radiation of Light.—CHARLES FABRY.—A description of the methods used for studying radiations of light, both visible and invisible, and a special discussion of the X-ray.—*Journal of Franklin Institute,* September, 1921.

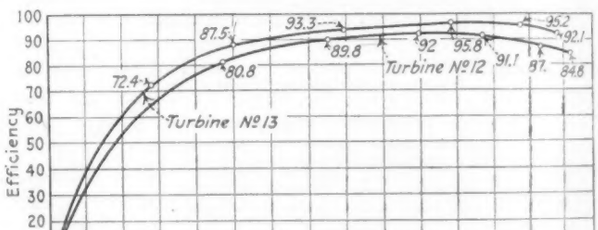
Generation, Transmission and Distribution

On the Distribution of Ground Currents.—R. RÜDENBERG.—A question frequently asked in transmission-line practice concerns the degree of danger incurred in walking near the base of a steel tower with a faulty insulator. The ground current J extending from the tower into the ground with a specific resistance ρ will cause along the surface an electric field of $e = \rho J/2\pi x^2$, which decreases as the square of the distance x from the tower. The potential difference between two points, separated by the distance s and distant x from the tower, will be

$$e_s = \frac{\rho J}{2\pi} \frac{S}{x\,(x+s)}.$$

Under favorable conditions e_s may reach considerably over 100 volts where s is equal to one step, or about 3 ft. from the base of the tower. The greatest value of e_s, corresponding to the most dangerous position, will result if one foot is on the ground and the other foot touches the tower. In summer, when the ground is dry and therefore poorly conducting, a very dangerous potential may exist along the ground surface of a tower after a rainstorm. Under favorable conditions as much as 15 per cent of the total ground current may then flow from foot to foot in one step. The author shows the beneficial influence of a steel cable strung from top to top of each tower along the entire line in reducing this danger.—*Elektrotechnische Zeitschrift,* Aug. 4, 1921.

Hydraulic Turbine Efficiency.—During official tests recently made on two new horizontal Francis twin turbines delivered by Karlstads Mekaniska Verkstad, Kristinehamn, Sweden, for the Swedish state plant at Trollhättan the efficiency curves shown here were



EFFICIENCY OF 13,200-HP. FRANCIS TURBINES

obtained. The turbines are rated at 13,200 hp. at 187 r.p.m. and a net head of 29.7 m. The maximum efficiency of turbine 13 (the latest one) was 95.8 per cent, while the efficiency exceeded 92 per cent from half to full load.—*Teknisk Tidskrift, Mekanik,* May 11, 1921.

Traction

Making a Modern 33-Hp. Tramway Motor Out of an Old 20-Hp. Motor.—J. V. BALSLEV.—Changing traffic conditions caused the Copenhagen street-car company to adopt the trailer system. It was at once realized, however, that the old Siemens 20-hp. car motors would very quickly break down under such heavy usage, and therefore a scheme was worked out for converting the 20-hp. motors into 33-hp. interpole motors running spark-free up to a load of 65 hp. The main features of the work were the following: 1. The armature slots were deepened 3 mm. to permit the use of the same number of wires per slot, while changing the area from 4.15 sq.mm., round, to 6.45 sq.mm., rectangular. 2. The field magnets were also rewound with rectangular wire, 20 sq.mm. being used, instead of the original 13.5 sq.mm., round wire, and at the same time the number of turns was cut from 99 to 100 per pole. 3. To insure good commutation four interpoles were inserted, the motors being four-pole series wound. 4. To compensate in part for the weakening of the field, the air gap

was cut down from 3 mm. to 2 mm., ball bearings being installed to prevent hugging, due to wear in the bearings. In this way the capacity of the motor was increased from 20 hp. to 33 hp., while the efficiency was increased from 83 per cent to 88 per cent. Since the total copper weight of field and armature was very nearly the same after the rebuilding as before the rebuilding, this improvement was won at the expense of only about 6 kg. additional copper per motor for the interpole windings. One hundred and thirty motors are being changed in this way, and of these fifty have already been in service for about six months, with excellent operating results.—*Teknisk Tidskrift, Elektroteknik,* May, 1921.

Installations, Systems and Appliances

Electrically Driven Lumber Mills.—J. N. DODDS.—A description of a mill with 3,400 hp. in electric motors. This is one of the large modern sawmills which have been changed over from steam drive to electric drive. The advantages of electric drive are discussed and the power requirements are given as follows: Average power for sawmill is 1,130 kw., or 41.8 watt-hours from log to sorting table per board-foot of timber cut. This does not include shingle mill, planing mill or gang saw. The gang saw would raise this figure to approximately 48 watt-hours. For a planing mill with a capacity of 12,500 board-feet per hour the power in put is 25.4 watt-hours per board foot. The shingle mill with a capacity of 25,000 shingles per hour requires 7.3 watt-hours per good shingle.—*General Electric Review,* September, 1921.

Cost of Rolling Steel in Various Mills.—G. E. STOLTZ.—A comparison of costs of driving rolling mills with electric power and steam engines is made in this paper. A big advantage pointed out for electric drive is that the energy measurements may be made very accurately to determine if the exact conditions of operation are being maintained. The record of power consumption in electrically driven mills is accurate, includes all incidentals and covers all periods. A slight change in some adjustment on the electrical equipment has reduced power consumption considerably. Small differences of the same character would not be detected on a steam-driven mill, and such refinement could not be obtained.—*Journal of Engineers' Club of Philadelphia,* September, 1921.

POWER AND MAIN-DRIVE OPERATING COST OF ROLLING STEEL IN ELECTRICALLY DRIVEN MILL

(34-in. reversing blooming mill; ingots 15-in. x 17-in., 4,200 lb.; blooms 8-in. x 8-in.; 6-in. x 6-in.; 4-in. x 4-in.)
All costs are based on cost per ton (2,240 lb.) of steel produced. Values are averages for years 1913 to 1919, inclusive.

Months in operation	10.43
Tonnage*	18,800†
Kilowatt-hours	21.2
Power cost	0.1445
Repairs and maintenance	0.0058
Miscellaneous supplies	0.0030
Labor in operation	0.0132
Total	0.1660

* Finished tons (2,240 lb.) on the blooming mill.
† Monthly average tonnage finished on the blooming mill over the entire period.

Electrochemistry and Batteries

Heat Treatment in Electric Furnaces.—EDWIN F. CONE.—A review is presented of electrical apparatus for furnaces used commercially in the United States as a means of heat-treating steel. Several companies have developed furnaces of types especially adapted to the product to be treated. Not only are castings and forging now being treated in such furnaces, but sheets, steel chains, automobile parts, axles, bolts, nuts and small parts for airplanes are being treated as well as non-ferrous and other products. In the steel field alone there are about eighty furnaces now installed or contracted for. Other furnaces are operating on non-ferrous material and the application to glass and other industries is growing.—*Iron Age,* Sept. 15, 1921.

—Gray-Iron from Electric Furnace.—JAMES L. CAWTHON, JR.—The advantages of electric furnaces and the superior quality of product are enumerated. As an indication of what can be expected from electric furnace iron, a user reports tensile strengths as high as 62,000 lb. (28,000 kg.) for iron made from scrap charges. Another reports an average of 5,100 lb. (2,300 kg.) transverse strength for iron made from gray-iron borings and axle turnings. An average analysis shows carbon 3.20 per cent, sulphur 0.05 per cent, phosphorus 0.25 per cent, manganese 0.70 per cent, silicon 2.19 per cent. The sulphur, it will be noted, is lower than is usual in cupola metal.—*Electric Journal,* September, 1921.

Units, Measurements and Instruments

Instrument for Measuring Frequency and Other Quantities.—R. C. CLINKER.—A description of a meter which may be used for measuring frequency and also capacity and inductance.—London *Electrician,* Aug. 5, 1921.

Telegraphy, Telephony and Signals

Transition Period in Radio Communication.—A. F. VAN DYCK.—Radio development has advanced by a series of steps rather than by a steady progress. The present transition period results from the application of comparatively recent inventions, and improved methods which have enlarged the general scope of the art to a heretofore undreamed-of degree have made wireless telephony practicable and have placed radio at last on a reliable basis of operation by displacing from the equipment those elements which at times were erratic in behavior. In this article these recent developments are described.—*General Electric Review,* September, 1921.

Telephone Cables and Amplifiers.—A. EBELING.—An interesting account of the history and development of the art of telephoning over long distances through cables, beginning with Professor Pupin's loading coils, their calculations and present use. The Krarup system of increasing the inductance of a cable by winding a layer of iron wire upon the copper conductors is mentioned as the second step. This system is used, for example, on the long submarine telephone cable in East Prussia. Then came the Brown microphone amplifier, based upon the electromagnetic principle, but never used practically, as it was superseded by the Lieben amplifier in 1910, which was a forerunner of the vacuum tube, and finally the present-day high vacuum electron tubes.—*Electrotechnische Zeitschrift,* Aug. 11, 1921.

Generators for Radio Telegraphy.—K. SCHMIDT.—This article deals with the development of the medium and high-frequency generators used today in radio work. It is written by an engineer of the C. Lorenz works and gives preference to the description of their machines.—*Zeitschrift für Drahtlose Telegrafie und Telefonie,* July, 1921.

Scientific and Industrial Research

(PRINTED IN THE THIRD ISSUE OF EACH MONTH)

A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available, and Suggestions for Co-operative Work.

Conducted by PROF. VLADIMIR KARAPETOFF
Cornell University, Ithaca, N. Y.

Research in Progress and Completed

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

CORONA ON AN ARTIFICIAL LINE.

An examination is being made of the effects of corona upon the losses and voltage and current distribution in an artificial line of usual construction provided with adjustable leaks in the form of thermionic vacuum tubes which simulate corona. The artificial corona appears to duplicate the actual corona except in regard to an ionized envelope which occurs around the latter, and harmonics can be studied with great ease.—*Massachusetts Institute of Technology, Cambridge, Mass.*

HARMONICS PRODUCED BY HYSTERESIS IN IRON-CORE TRANSFORMERS.

Higher-frequency circulating currents due to the above cause are sometimes found in the secondary or tertiary windings of iron-core transformers and in the connected transmission lines. A detailed study of such harmonics with various single-phase and polyphase connections is being made. Data have been secured and numerous oscillograms taken.—*Massachusetts Institute of Technology, Cambridge, Mass.*

RECEIVERS FOR RADIO USE, TESTS OF.

A comprehensive study of the telephone receivers used in radio telegraphy and radio telephony is in progress. The tests include measurements to determine the loudness of response given by different types of telephones as well as the electrical characteristics which determine how satisfactorily they fit the electrical apparatus in which they are used. Accurate methods are being devised for these measurements.—*Bureau of Standards.*

GASES, DIELECTRIC STRENGTH OF.

A study is being made of the dielectric strength of gases other than air. The method used is that of observing the first appearance of corona on round wires and is a continuation of the work recently published in the A. I. E. E. Journal. —*F. W. Lee, Johns Hopkins University, Baltimore.*

EMISSIVE POWER OF METALS, TOTAL THERMAL.

A formula has been developed by which the total thermal emissive power of metals may be calculated from their electrical resistivity. The formula has been tested in the case of chemically pure platinum and found to represent the observed emissive powers accurately up to a temperature of about 1,000 deg. K. This is of importance in the design of all heat cathode apparatus such as radio amplifiers.—*C. Davisson, Research Laboratories of American Telephone & Telegraph Company and Western Electric Company, New York City.*

AMPLIFICATION OF ELECTRIC CURRENT IN THE BUNSEN FLAME.

When an electric current is caused to flow between two dissimilar electrodes in a Bunsen flame there is usually a rectification or valve effect present. The resistance to current flow is much less in the direction which offers a cathode capable of emitting negative ions when heated. A third electrode of special type has been used to regulate the emission of the cathode and to produce amplification effects in a fashion similar to the grid of the audion. For some purposes the device is satisfactory, being easily set up and operated, but the output is small in a single-flame arrangement. Steady, reproducible conditions would be difficult to realize outside the laboratory.—*C. W. Heaps, Rice Institute, Houston, Tex.*

SPEED CONTROL OF SECTIONALIZED MOTOR DRIVE.

A new form of motor drive for paper mills has been developed in which synchronous motors are used for speed control. A small synchronous motor is mounted on the base of each driving motor and is connected to it by a gear and two belted cones. The speed of each driving motor may be adjusted with respect to the others, and unvarying speed relation between all units is maintained as positive as though they were geared together.—*Industrial and Domestic Power Committee, A. I. E. E.*

RECTIFIER, THERMIONIC.

A new low-power thermionic rectifier for alternating current has been devised which takes the form of an ordinary electric light bulb and from which direct current of the order of 100 milliamperes may be taken. A flat nickel plate is inserted between the two legs of a spiral tungsten horseshoe, and the load is connected across the plate and the middle of the tungsten filament. In this manner the bulb may be used at the same time as an ordinary lamp, although it is more efficient as a rectifier when the filament is inclosed in a cylindrical anode.—*John Scott-Taggart, London, England.*

CURRENT TRANSFORMER.

A new design of current transformer has been developed which has an auxiliary winding in addition to the regular secondary winding. With this winding the phase angle may be brought virtually to zero and the ratio corrected for a wide range of load conditions. This type of transformer promises to be of considerable value as a high-grade standard and in extending the range over which commercial types of transformers may be used with accuracy.—*H. B. Brooks, Washington, D. C.*

STEEL, MANGANESE, MAGNETIC, MECHANICAL ANALYSIS OF.

In a comparative study of the Joule and Villari magnetic effects on a series of ferromagnetic substances, observations of those two effects in manganese steel were recently completed. Manganese steel is particularly interesting from the magnetic standpoint in that ordinarily it is non-magnetic, becoming magnetic when heat-treated at about 500 deg. C. for sixty hours. The manganese steel rod thus studied showed properties quite different from ordinary steel, and the full value of the results cannot be estimated until exhaustive studies have been made of other ferromagnetic substances.—*S. R. Williams, Oberlin, Ohio.*

COAL MINES, STORAGE-BATTERY LOCOMOTIVES FOR.

Preliminary laboratory tests and field investigations were made in co-operation with locomotive manufacturers to determine the permissibility of storage-battery locomotives in mines containing explosive gases.—*Bureau of Mines, Washington, D. C.*

TRANSMITTER, ELECTRON TUBE, FOR COMPLETELY MODULATED WAVES.

The modulation of the wave train of an electron tube generator for non-oscillating receiving systems by the use of high direct voltage interrupted mechanically is often inconvenient. A compact transmitting set has been designed and built which uses audio-frequency alternating current for the modulation. The current is supplied from an alternator which supplies the power through suitable transformers for both the filament and the plate circuits. An over-all efficiency from alternator terminals to the antenna of as high as 35 per cent has been obtained. Tests have shown that though it cannot be received by crystal detectors at quite so great a range as a spark set of the same power, for heterodyne reception it is virtually the equivalent of a continuous-wave transmitter of the same power output and can be received over a somewhat smaller range by any non-oscillating detector.—*Lewis M. Hull, Bureau of Standards, Washington, D. C.*

Suggestions for Research

WAVE ANALYSIS BY ELECTRIC MEANS.

An irregular wave can be resolved into its sinusoidal components (Fourier series) analytically, graphically or by means of a mechanical analyzer. All these methods are either tedious or require an expensive and delicate piece of apparatus. Prof. F. S. Dellenbaugh, Jr., has developed an electric analyzer (*Journal A. I. E. E.*, 1921, page 135) which in its present form is suitable only for a few lower harmonics because the result is based on only eleven ordinates of the half wave (15 deg. apart). It would be very desirable further to improve and develop this device to enable a curve to be represented by a much larger number of ordinates without making the arrangement much more complicated. The goal to strive for is an electrical device such that by tracing a given oscillogram with a stylus a desired harmonic shall be determined in its phase and amplitude.

MOTORS, INDUCTION, IRON LOSS IN.

This subject has been studied to some extent and several formulas have been deduced, but as far as the writer knows no one has investigated the subject thoroughly enough to give a scientific or mathematical explanation for making definite calculations in predetermining the iron loss in a new design of motor. Each designer, of course, accumulates a great deal of information along this line and gets a fair idea of cause and effect, but as far as we know this information has not been correlated so as to be of practical use to other designers.—*J. L. Hamilton, St. Louis, Mo.*

CURRENT TRANSFORMERS, TESTING OF.

There is a need of a rapid and accurate commercial method of testing current transformers in advance of what has been available up to the present time.—*Meter Committee, N. E. L. A.*

LOCATION OF SUBMERGED STEEL OBJECTS.

A large all-steel coal car being towed across Blue Mountain Lake recently was tipped into the lake by the sinking of the float. It lies in 30 ft. or 40 ft. of water, possibly embedded in mud. We have failed to locate it by dragging or diving. There may be some method of finding it by electricity or magnetism. If so, what apparatus would be needed and where could it be obtained?—*Raquette Lake Transportation Company, Hamilton County, N. Y.*

[This is a case where some of the methods developed for locating enemy submarines may be applied to a peace problem.—EDITORS.]

MACHINERY, ELECTRICAL, THEORY OF THE ACTIVE LAYER.

That part of an electrical machine which comprises the air gap and the adjacent portions of the two iron cores with their windings is known as the active layer of the machine. The principal electromagnetic phenomena and energy transformations take place in this layer. A general theory of this layer is desired, with magnetomotive forces arbitrarily distributed in space and in time and with one iron core moving at an arbitrary velocity with respect to the other. The final formula of such a theory could then be applied to obtain directly the important characteristics of the principal types of machinery or to predict the performance of a proposed new type.—*Editorial Suggestion.*

COPPER, COMPARATIVE PROPERTIES OF, WHEN HARDENED IN TWO WAYS.

There are two well-known ways of hardening copper—by means of mechanical working and to alloy it with a certain amount of another metal. Further investigation is desired as to the exact properties and the relative advantages and electrical uses of the copper hardened in the two ways.—*Bureau of Standards, Washington, D. C.*

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

California Municipal Officers Indorse State Development of Power

AT THE recent annual meeting of the California League of Municipalities a resolution was passed approving the proposed initiative measure which would establish a hydro-electric power state board fashioned after the Ontario Hydro-Electric Power Commission plan. The resolution met with but little opposition as the delegates to the meeting were officials of the various cities and towns of the state and expressed themselves generally as being in favor of movements which would extend political ownership and control of utilities. Among the speakers during the convention was Gifford Pinchot, former head of the Bureau of Forestry, who voiced his views in favor of political ownership.

Edward Wolfe, former State Senator and now a supervisor of San Francisco, touched upon the most vital point in the campaign for state power when he said that "Just so sure as you let the impression go forth that this state is hostile to private enterprises, your efforts will fail, even though you put the credit of the state back of state power to the extent of $500,000,000."

Basic Soundness of Electrical Industry as Seen by F. A. Ketcham

BLAMING the present inactivity in the household appliance market on overproduction and forced selling methods, F. A. Ketcham, general sales manager of the Western Electric Company, recently asserted his complete faith in the fundamental soundness of the electrical business. "Just so surely," Mr. Ketcham said, "as electricity shall continue to play an important part in the march of civilization, in the field of power, transportation, communication, illumination and the other phases of everyday life, just as surely will the foundation of our business rest secure and the demands for the products we sell continue.

"There are sound reasons for our confidence," he continued. "Although the sales to the supply trade this year have fallen under the 1920 figures, there are sections of the country in which the demand is greater than it was twelve months ago. As a whole, however, we expect the increase in our business to come about slowly.

"The public utilities offer the best field for sales efforts at the present time. Having recovered from the handicaps they faced during the war, the electric light and power companies, the telephone companies, and to a lesser extent the other media of national service, are improving and adding to their systems.

"Far-sighted manufacturers are also taking advantage of the inactivity that prevails in their respective spheres now to get ready for the production demands of the future. They are putting their plants in shape by improving their lighting facilities and adopting the latest applications in electrical labor-saving devices. The smaller electrical contractors offer promising sales opportunities just now. While there has been a falling off in all the larger type of building operations, the smaller contractors are increasingly active in keeping up with the demands for the wiring of new homes."

State Inspection of Electric Wiring Proposed for Oregon

WORK has been started by J. H. Sroufe, chairman of the Oregon Association of Electrical Contractors and Dealers, to establish adequate state inspection of electric wiring, and with this end in view a committee headed by L. W. Going, chief electrical inspector of the city of Portland, has been appointed. This committee is holding regular meetings for the purpose of getting into shape an inspection law to be presented at the next session of the State Legislature.

A law was passed in 1919 establishing wiring rules. The enforcement of this act was placed in the hands of the Commissioner of Labor, and a provision was made for raising some revenue to provide for inspection by requiring the payment of a license fee by all electrical contractors.

Two years of operation under this law have proved that the license fees are entirely inadequate to give satisfactory inspection.

Narragansett Customers Will Get Benefit of Refund by Coal Dealer

THE Narragansett Electric Lighting Company of Providence, R. I., and its subsidiaries will distribute indirectly to consumers during the next twelve months $37,997.29, which will operate as a reduction in the cost of electricity. The company's plan, as presented to the Public Utilities Commission of Rhode Island and approved by that body, has become effective at once, without the thirty-day statutory notice. The consequent reduction in costs cannot be foretold, as it is contingent upon the amount of energy used.

In 1919 and 1920 the Narragansett company contracted for coal of a certain quality, but failed to get the quality and quantity specified. A claim for reimbursement made against the coal contractor led finally to a settlement in which the Narragansett company received $37,997.29. The company decided that this money did not belong to it, but rather to its customers, and plans for refunding it have terminated in the decision to apply the amount in twelve monthly installments to the fuel costs for the next year, starting with September. Accordingly, the company filed a new fuel clause under which the rates will vary each month instead of every three months.

By having a monthly adjustment the company be-

lieves the rates will be more responsive to the fluctuation of fuel costs, and the monthly installments will be deducted from the fuel cost before the rate is fixed. Rates of the Bristol County Gas & Electric, Wickford Light & Power and Narragansett Light & Power Companies will be affected by the adjustment.

Electric Utility Safeguards Discussed at Boston Meeting

NATION-WIDE interest in accident prevention was displayed by the representatives of many public utility, industrial, philanthropic and scientific organizations at the tenth annual congress of the National Safety Council, held at Boston, Sept. 26 to 30. Electrical interests received much attention, and at a luncheon on the twenty-seventh an inspiriting address upon the worldwide economic importance of safety engineering was delivered by Dr. William McClellan, president of the American Institute of Electrical Engineers, who declared that too many persons believe the safety movement to be a philanthropic activity and that its economic value is far from appreciated. Into the great movements of the times, epitomized by the slogan "Work and save," the safety engineer fits with economic justification. In stating the problems which are at hand for solution by engineers and economists, Dr. McClellan said that a Federal Reserve system is needed for labor as well as for capital, and that the elimination of waste in the operation of railroads, the development of water power, mining and distribution of fuel and the conservation of resources demand the energetic activity of all trained workers in applied science and economics.

Safeguarding hydro-electric plant employees from accidents was discussed in a paper before the Public Utilities Section by A. E. Bauhan, superintendent of stations, Pennsylvania Water & Power Company, Baltimore. Attention was concentrated upon the hydraulic side of such plants, including the consideration of hazards of various kinds. The hold-off system used at the Holtwood plant of the company was described. The company has abandoned the use of voltages higher than 32 in wheel-pit lighting. The author discussed in detail many features of safety practice which will be recapitulated in a later issue. An interesting conclusion was that in long-established plants the responsibility for safety observance should be placed upon the man in charge rather than upon a special committee, although full co-operation of all employees is, of course, essential.

John Morse, general superintendent Shawinigan Water & Power Company, Montreal, said that where virtually all operations are performed from a control room one or two hold-off tags placed on the controller handles are ordinarily considered ample protection. As an extra precaution at Shawinigan Falls the fuse plugs on the control circuits are removed by the operator. Simple, definite designations of apparatus are most important, and the grounding of all circuits worked on was commended. Unified responsibility in maintenance work, care in working around racks in winter and sympathy on the part of operating men with safety work are deemed essential to safety.

Wills Maclachlan, consulting engineer, Toronto, said that 4-in. x 4-in. timbers on top of racks enable heelholds to be retained during winter cleaning and that chains on stop-log winches should always be up when not in use. At the Niagara Falls plant of the Ontario Power Company, where 100 men are employed, interest in safety committee work is so great that monthly rather than quarterly meetings to discuss safety are urged by the employees. Adequate illumination, the speaker said, is of immense importance around such plants. Running circuits in conduit near hand rails and the use of safety-type porcelain sockets with suitable illumination were urged by J. F. Conner, United Gas Improvement Company, Philadelphia, and G. R. Rinke, Utility Mutual Insurance Company, New York, advocated care in the use of oxyacetylene welding in confined areas. The prevention of surge-tank accidents from the forcing out of ice was also touched upon.

ORGANIZED SAFEGUARDS FOR DISTRIBUTION SYSTEMS

A. B. Gates, Commonwealth Edison Company, Chicago, presented a paper upon "Care in the Construction and Maintenance of Overhead Lines," in which the importance of line designing from the safety standpoint was considered, together with safe working methods. The use of open types of construction was illustrated, and the opportunities offered employees for a voice in management through insistence upon safety practices by themselves and others were emphasized. The paper illustrated to what a remarkable extent safety engineering has lately entered the field of line construction and operation, and extracts from it will be presented in detail at a later time.

Other topics of interest to the electrical industry which were discussed at the congress included addresses on "Better Industrial Lighting," by R. W. Shenton, National Lamp Works, Cleveland, and A. S. Turner, Edison Lamp Works, Harrison, N. J.; "Electrical Hazards in and Proper Installation of Equipment," by W. J. Pefferly, Square D Company, Detroit; "Electrical Hazards in Foundries and Steel Mills," by Walter Greenwood, Carnegie Steel Company, Youngstown, Ohio (ELECTRICAL WORLD, Oct. 1, page 675); "The Use of Protective Devices," by Wills Maclachlan; "First Aid in the Telephone Field," by F. M. Downey, New York Telephone Company, and "The Necessity for Executive Support," by C. B. Scott, general manager Bureau of Safety, Chicago.

Ohio Companies Reduce Rates Voluntarily

REDUCTIONS in electric light and power rates, which became effective Oct. 1, have been made by the Springfield (Ohio) Light, Heat & Power Company. The reductions in the power rates range from 12 to 24 per cent, while the residence lighting rate is reduced from 12 cents to 11 cents for the first 15 kw.-hr., with the charge of 7 cents for each additional kilowatt-hour unchanged. The reduction is voluntary on the part of the company, which said in its announcement that the cuts were in line with lower costs for production. Further reductions are anticipated within the next few months, company officials said.

The Northwestern Ohio Light & Power Company, furnishing electric light and power to about twenty Ohio cities and towns, has also filed reduced power rates with the Public Utilities Commission, to become effective Nov. 1. The reductions average about 12 per cent. No change in the domestic lighting rate is made by the company, although it is understood the matter has been discussed with the municipal authorities.

Dinner to Returning Delegates of Engineering Societies

THE delegates of the four national engineering societies and others who went to England and France last summer to convey messages of fraternal greeting and appreciation to the engineers of those countries and to bestow the John Fritz medal on Sir Robert Hadfield of England and Eugene Schneider of France were tendered a dinner in New York on Oct. 10. Most of the delegation, which comprised Ambrose Swasey, Arthur S. Dwight, Charles F. Rand, Charles T. Main, John R. Freeman, Robert A. Cummings, Ira N. Hollis, Jesse M. Smith, William Kelly, F. B. Jewett, A. E. Kennelly and G. O. Squier, were present and briefly described their observations and impressions. J. V. Davis, president of the United Engineering Society, presided, and in addition to the talks made by the delegates, speeches were made by the British and French Consuls stationed at New York and by G. G. Clapperton, representing the British engineering societies, and Prof. Jacques Cavalier, speaking for the French. The desirability of greater unity and co-operation between the engineers of England, France and the United States was frequently voiced through the evening. As a token of appreciation and as an earnest of amity and friendship as well as of commemoration the French government, through Gaston Liebert, bestowed medals on Ambrose Swasey, Charles J. Main, Dr. Ira N. Hollis, A. S. Dwight, F. B. Jewett, G. S. Webster, E. Ludlow, E. S. Carman and William McClellan.

Public Seems to Be Turning Away from Home Rule in Utility Regulation

THE wave of sentiment in favor of home rule in the regulation of utilities which threatened to assume considerable proportions about a year ago, just before the elections, has abated, and there is now every indication that the public is absolutely reversing its position. M. H. Aylesworth, executive manager of the National Electric Light Association, who recently returned from an extensive trip through the Middle West and Rocky Mountain regions, says that it was forcibly impressed upon him during the trip that the people were turning against home rule.

"There seems," Mr. Aylesworth said, "to have been an awakening on the part of the public to the fact that home-rule regulation would result in poor service and in a much lessened service to the rural communities. This is due particularly to the circumstance that local authorities have been unable to cope intelligently with the problem of regulation, which is a specialized subject and of state-wide importance."

The farmer, of course, has never been misled, because of the effect of home rule on his comfort. This is well set forth in a recent issue of the *Southwest Farmer*, which says editorially:

> The day is past when the electric light and power company operation is to be confined within the city limits. The development of the electric power industry to the extent where electrical energy is now carried hundreds of miles over high-powered transmission lines has wiped out the "city limits."
>
> The farmer should come into his own. The farmer would come into his own were it not for the restrictions, limitations, arrestments and obstructions which are thrown in the way of development of the electrical industry by the people who live in the cities and think that they should have "home rule" over those public utilities which are in the business of generating electric power and distributing it to other people 300 miles away.

Utility Commissioners Come Out Strong Against Government Ownership

MEMBERS from thirty-two states were present at the opening session of the annual meeting of the National Association of Railway and Utility Commissioners, held in Atlanta, Ga., on Tuesday to Friday of this week. James A. Perry, president of the association, in a stirring address opposed vigorously centralization in Washington, in the Interstate Commerce Commission, of control over all railroad rates, thereby destroying the power of the states to regulate their domestic commerce. In discussing the local problems of utilities, such as electric light, street railway and gas companies, Commissioner Perry asserted that the rates have been too low, generally speaking, throughout the country for the past two years, and he predicted that a continuance of this policy of dealing with local utilities will very soon drive capital entirely away from utility investments, if, indeed, it has not to a large extent already done so.

The time has come, declared Commissioner Perry, for the public to realize that it is equally interested with utility stockholders in adequate service and adequate returns upon the value of the properties devoted to the public use. It is time for the public to realize that community growth is dependent upon utility growth, and that utility growth is dependent upon the investment of capital, and that investors of capital will not put their money into utility property when utilities are not allowed to earn as much as the legal rate of interest in the states where they operate.

Public or government ownership of public utilities, with either public or private operation, was strongly opposed in the report of the public ownership and operation committee, submitted at the afternoon session on Tuesday. The committee, whose report was submitted after an exhaustive inquiry into matters concerning government and private ownership both in the United States and abroad, went on record as favoring privately owned and privately operated public utilities, with the proviso that all utilities should have public regulation. Striking instances of the failure of government ownership were cited. The report declared that "the public must be given fair and adequate service at a reasonable cost," and that the safeguarding of these essential rights of the people makes the existence of regulatory bodies a necessity.

"Such regulatory governmental bodies, however," the report said, "at the same time must be sufficiently wise and fair and far-seeing to stand between the utility in question and unthinking, hasty public clamor not based upon full knowledge and careful thought. Public utilities are subject to the same financial laws of operation as are private enterprises. They must operate successfully in order successfully and adequately to fulfill their duty of service to the public.

"It therefore follows that, in order to maintain a just, equitable balance, and even to keep such utilities out of bankruptcy, it is necessary to maintain their higher rates longer than would to the layman seem necessary, judging by the surrounding decline in commodity prices. To follow any other policy would be to put such utilities out of business and to discontinue that service to which the public is so justly entitled

and which is now more necessary to the return of the vast bulk of private business to the desired goal of normalcy."

The report was submitted by a committee consisting of Commissioners A. G. Patterson of Alabama, chairman; W. C. Bliss, Rhode Island; F. R. Spinning, Washington; H. H. Williams, New Mexico; H. A. Russell, Kansas; L. H. Porter, Vermont, and James Cansler, South Carolina.

REGULATION SINCE THE WAR

Wednesday afternoon was devoted to a round-table discussion on after-the-war phases of regulation, presided over by Henry G. Wells of the Massachusetts commission. In opening the discussion he pointed out that regulation should not penalize efficiency and place a premium on inefficiency. He referred to financing of utilities as one of the great problems and related how a solution was brought about in his state by adequate legislation. Other commissioners dwelt on the need of fairness and truthfulness in presenting cases to them in order to inspire confidence in the basis for the argument of the utility. Customer-ownership programs were viewed with much favor by commissioners and considered to afford a solution to a part of the financing problem. They urged that harmony be sought by every method.

S. Z. Mitchell and Martin Insull spoke for committees representing the American Gas Association and the N. E. L. A. Mr. Mitchell explained the service viewpoint in utility operation and emphasized the need for more money to supply existing service demands and a sufficient rate to make the securities attractive to investors in order to raise funds for new work and needed improvements. He urged prompt action by the commissions and expressed the hope that funds would be made available to commissions to employ needed assistance to study utility matters. Mr. Mitchell also showed why it is imperative to "go slow" in rate reductions, which would still further impair service and future development and betterments.

MUTUAL UNDERSTANDING

Mr. Insull emphasized the point that after-war regulation should not differ essentially from regulation at any other time. The important thing is a mutual understanding between utilities and the commissions in their function of serving the public. He also considered it important to educate the public as to what constitutes service. In dealing with these problems he urged that they be approached with good will, good humor and good sense on the part of both utilities and commissions.

On Wednesday evening a banquet was tendered the association by the Presidents' Club of Atlanta, which is a club comprising presidents of some fifty-two civic bodies. Mell R. Wilkinson was toastmaster, and addresses were made by prominent business men, including Carl D. Jackson, president-elect, and James A. Perry, retiring president of the association; Harford Powel, editor of *Collier's Weekly*, and Joseph B. Eastman of the Interstate Commerce Commission. Arrangements for the banquet and other entertainment features were carried out by J. Prince Webster, formerly a member of the Georgia Railroad Commission.

Thursday's and Friday's proceedings will be reported in a later issue of the ELECTRICAL WORLD.

Public Relations Occupy Tenney Service Convention

IMPROVEMENT of public relations and increased efficiency of service individually and collectively occupied the close attention of about 250 executives and departmental leaders in the utility properties affiliated with Charles H. Tenney & Company, Boston, at the twelfth annual convention of the organization, held in that city on Monday and Tuesday of this week. The program included three business sessions and a luncheon, with an address Tuesday noon by Governor Cox of Massachusetts. A talk on "Public Utility Organization" by M. H. Aylesworth, executive manager National Electric Light Association, and an address on European conditions by W. Irving Bullard, vice-president Merchants' National Bank, Boston, were given on Monday, following a keynote address by Col. Charles H. Tenney on the importance of a sane financial outlook.

H. T. Sands presided at the opening session, and D. E. Manson opened the meeting Tuesday morning with a program embracing the following topics: "The Tenney Organization," by Palmer York; "Good Housekeeping and Bad," by A. E. Bliss; "The Trend of Public Utility Legislation," by Allen Hollis, and "Present-Day Public Utility Obligations," by H. T. Sands.

Washington Conference on Unemployment Issues Recommendations

WITHOUT attempting the impossible task of assessing the relative weight of different forces, the Conference on Unemployment now meeting at Washington under government auspices has made the following summary of the more important matters that require constructive and immediate settlement if recovery in business and permanent employment are to be speedily brought about:

1. Readjustment of railway rates to a fairer basis of the relative value of commodities, with special consideration of the rates upon primary commodities at the same time safeguarding the financial stability of the railways.
2. Speedy completion of the tax bill with the contemplated reduction of taxes, in order that business now held back pending definite determination may proceed.
3. Definite settlement of tariff legislation in order that business may determine its future conduct and policies.
4. Settlement of the financial relationships between the government and the railways, having in mind the immediate necessity for increased maintenance and betterments, making effective increased railway employment and stimulation of general employment, in order that the railways may be prepared for enlarged business as it comes.
5. Limitation of world armament and consequent increase of tranquillity and further decrease of the tax burden not only of the United States but of other countries.
6. Steps looking to the minimizing of fluctuations in exchange, because recovery from the great slump in exports (due to the economic situation in Europe) cannot make substantial progress so long as extravagant daily fluctuations continue in foreign exchange, for no merchant can determine the delivery cost of any international shipment.
7. Definite programs of action that will lead to elimination of waste and more regular employment in seasonal and intermittent industries, notably in the coal industry, in order that the drain upon capital may be lessened and the annual income of workers may be increased.
8. In the field of all the different industries and occupations the rapidity of recovery will depend greatly upon the speed of proportionate adjustment of the inequalities in deflation.

San Joaquin Light & Power 7 per cent Bonds Offered at Par

EVIDENCE of the growing strength of electric light and power company securities is found in the offer by the San Joaquin Light & Power Corporation of $1,500,000 of unifying and refunding 7 per cent bonds at par. These bonds are a thirty-year issue, due March 1, 1951, and the low rate of return which they carry indicates that in the case of good public utility long-term bonds money is thought to be now procurable at a reasonable price.

N. E. L. A. Good-Will Film to Be Distributed

ARRANGEMENTS have been made for the distribution to N. E. L. A. member companies of the one-reel feature film entitled "Back of the Button" prepared for the association by the Rothacker Film Manufacturing Company and shown for the first time at the Chicago convention in May. This is the first of a series of motion pictures to be produced by the association for the benefit of the entire industry. It is expected that these films will place before the public all of the benefits of electric light and power service and also bring out the problems with which the industry is confronted.

Reclamation Service Makes Recommendations on Colorado River

ALL EXISTING data bearing directly upon the problems of the lower Colorado River have been condensed in a single report prepared by the Reclamation Service. Since the publication of a preliminary report a year ago by the irrigation committee of the House of Representatives further investigations have been made and embodied in the report, which comprises six volumes. The recommendations which form a part of the report are as follows:

1. That through suitable legislation the United States participate in the construction of the Boulder Canyon Reservoir and the High Line Canal from Laguna dam to the Imperial Valley, in proportion to the interests of the public lands and the Indian lands as set forth in the report.

2. That the Secretary of the Interior be authorized to enter immediately into contracts with such states, counties, municipalities and other interests as may desire to participate in the benefits of the construction herein recommended, provided that each participating agency furnish funds with which to defray its proportionate share of the expense, as allocated by a board to be appointed.

3. That there be appointed a board of three competent persons who shall not be resident in any of the states affected by the decisions of the board and who shall have no financial interest in those decisions, one being an irrigation engineer, one a power engineer and one learned in irrigation law, to allocate the cost and benefits of the proposed construction and assess the cost upon those receiving the benefits in proportion to such benefits. The decisions of this board should supersede the preliminary allocation recommended in this report, and contract should be entered into with all participating parties to abide by the decisions of this board and to supply funds for construction in proportion to benefits as determined by the board.

4. That the Secretary of the Interior be authorized to proceed with the work of development as rapidly as the funds are made available from any of the sources provided.

The report embraces the quantity and regularity of water supply for irrigation, data pertaining to flood control, data concerning storage facilities, and information as to the amount of land available for irrigation and the canal systems which will be required.

The opinion is expressed in the report that "the investigations at Boulder Canyon have shown the feasibility of a high dam at that point. The amount of storage which would be furnished by this dam has been computed at contour elevations ranging from 750 ft. to 1,300 ft., showing that the capacity would range from 58,750 acre-feet to 31,600,000 acre-feet. The canyon walls extend to the 2,000-ft. contour, or 700 ft. higher than the contour which would result in a capacity of 31,600,000 acre-feet.

The entire matter is to be taken up at a public hearing before the Secretary of the Interior in Washington on Oct. 27.

Must Maintain Values in Local Stock-Selling Campaigns

PUBLIC relations, with emphasis on the sale of securities locally, was the dominant subject of the convention last week at the Lake Placid Club, Lake Placid, N. Y., of the Empire State Gas and Electric Association. The program, which was particularly attractive in that it concentrated on a small number of important topics, drew representatives from about 150 utilities. Especial emphasis during the discussion was placed on local stock selling for maintaining values. President H. W. Peck opened the convention with a review of the past year and urged that particular attention be given to the questions of taxation, wage adjustment and sales of securities to the customer as the paramount issues of the year ahead.

The Thursday morning session was given over in large part to the consideration of public relations as a factor in the value of utility securities, with an address by H. M. Addinsell. Mr. Addinsell urged the sale of stock to the public in as large an amount as can be easily marketed with as small a bond issue as possible, but sounded the warning that during the sale of securities to the public proper measures should be taken to insure that the price of the stock on the open market be not less than the company's price, lest customers' securities depreciate in value and there be a reaction in public sentiment. J. T. Hutchings pointed out that the utilities have two purposes in selling stock—to obtain money and to improve relations with the public—and that therefore the value of the securities after selling should be conscientiously maintained. E. H. Palmer of Geneva stated that his company is publishing monthly in its house organ a detailed financial report for the information of customers who own the company's securities.

The committee on rural lines reported on the special need for rural rate classification and submitted rural service schedules recommended for varying conditions. Thursday evening was devoted to a banquet, followed by a lantern-slide address by Col. John P. Hogan on the "Electric Power Situation in New York City." Music was furnished by the "Con-Gas quartet."

Chairman Prendergast of the Public Service Commission addressed the convention on Friday morning and discussed the gas situation in Greater New York, recommending the consolidation of all gas companies in the greater city with a gradual assumption of ownership by the municipality. An address by Loyal S. Wright of Manlius, N. Y., followed on the subject "Serving the Public." Mr. Wright graphically illustrated the

principles of service and the natural laws which measure the value of the service.

The following officers were elected for the coming year: President, E. H. Rosenquest; first vice-president, E. H. Beal; second vice-president, S. J. Magee; treasurer, W. J. Welch.

Plant Distribution Discussed by Steel Engineers

"POWER Distribution in Industrial Plants" was a topic that elicited considerable interest at the Philadelphia Section meeting of the Association of Iron and Steel Electrical Engineers last Saturday. The paper of the evening was presented by K. M. Raynor, assistant superintendent electrical department, Lehigh plant, Bethlehem Steel Company. Mr. Raynor referred to a 6,600-volt, three-phase overhead circuit which ties together six substations at the Lehigh plant. Each phase consists of two conductors which pass through current transformers at the entrance to and exit from each substation. These transformers are connected to relays in such a manner that an unbalance of load equal to 50 per cent of the normal rated load will trip the oil switches at each end of the circuit affected, thereby isolating the trouble. After two years' operation the system has cleared all cases of trouble with the exception of one.

In discussing this subject, Harold Goodwin called attention to the fact that the cost of relays is negligible compared with the value of the protection they afford.

R. B. Gerhardt contended that systems involving the distribution of large amounts of power cannot be operated with the same degree of reliability with the radial system as with the loop system. For relay protection he expressed a preference for the wattmeter type of relay rather than the bellows type. With the simple loop the number of substations which can be connected with the system is limited because of the time setting of relays and the time required for oil switches to operate, Mr. Gerhardt asserted. On the other hand, with split-conductor systems like that to which Mr. Raynor referred there is no limitation. However, Mr. Gerhardt said, the balanced relay system does not afford any protection in case of trouble on the substation busbars.

International Pooling of World's Radio Facilities Planned

REPRESENTATIVES of American wireless interests are now in Paris discussing world radio matters with a view to forming a combination of British, French, German and American radio facilities. Daily conferences are being held by the delegates, who expect to complete arrangements before Nov. 1. The proposed agreement is the outgrowth of a desire to place international wireless service on a sound commercial basis. Radio facilities of the four countries will in effect be pooled, but the companies in each country will retain control over their respective territory. It is thus expected to eliminate a great deal of waste occasioned in the past by duplication of equipment by the different organizations. The governments concerned have approved the conference.

The formation of an international corporation consolidating the radio interests in the various countries is not contemplated, according to David Sarnoff, general manager of the Radio Corporation of America. Mr. Sarnoff stated to a representative of the ELECTRICAL WORLD that the negotiations in Paris have not yet been completed but that details of the agreement will be given out when the American representatives return.

The American delegation includes Owen D. Young, vice-president of the General Electric Company; Edward J. Nally, president of the Radio Corporation of America, and J. W. Elwood. The Westinghouse interests are also represented. British interests are represented by Godfrey Isaacs of the British Marconi Company, those of France by E. Girardeau of the French Wireless Company, and those of Germany by C. Shapiro of the Telefunken Company.

September Licenses and Permits Issued by Federal Power Commission

APPLICATIONS for licenses and preliminary permits were received by the Federal Power Commission during September as follows, the name and address of the applicant, the type of application, the type of project, its location, its proposed use, the horsepower involved and "conflicts," if any, being shown:

Darwin Silver Company, Independence, Cal.; license; transmission line from Los Angeles line to mining property; mining purposes.

Gladstone Mining Company, Buena Vista, Col.; license; power development; Denny Creek, Col.; mining; power capacity, 100 hp.; installed capacity, 100 hp.

Rio Grande Light, Heat & Power Company, Albuquerque, N. M.; license; power project in Rock Canyon, Sandoval and Santa Fé Counties, N. M.; public utility; power capacity, 2,750 hp.; installed capacity, 25,000 hp.

Frank C. Dougherty, San Francisco; preliminary permit; four power projects on Crater, Long and Tease Lakes and at Sweetheart Falls near Port Snettisham, Alaska; pulp and paper manufacture; installed capacity, 80,000 hp.; power capacity, 66,000 hp.; conflicts with the application of the Speel River Company.

W. H. Samson, Corning, Cal.; preliminary permit; power project, Stuart's Fork of Trinity River; public utility; power capacity, 15,000 hp.; installed capacity, 25,000 hp.

Southern Sierras Power Company, San Francisco; preliminary permit; power project; Bear Creek and Santa Ana River, Riverside County, Cal.; public utility; power capacity, 5,000 hp.; installed capacity, 25,000 hp.; all in conflict with the application of J. G. Van Zandt.

Lars Jorgensen, San Francisco; preliminary permit; three major and three minor projects on the Middle Fork of Feather River in Plumas, Sierra and Butte Counties, Cal.; public utility; power capacity, 200,000 hp.; installed capacity, 350,000 hp.; in partial conflict with the application of the Richpoint Mining Company, the Great Western Power Company and with the application of R. T. Harding. The project contemplates the creation of six large reservoirs storing a total of 372,000 acre-feet, the construction of several diversion dams, several miles of conduits and tunnels and six power houses.

Northern States Power Company, Chicago; preliminary permit; six projects on the Mississippi and the St. Croix Rivers in Burnett and Polk Counties, Wis., and in Pine and Chicago Counties, Minn.; public utility; power capacity, 30,000 hp.; installed capacity, 60,000 hp.; in direct conflict with applications of J. D. Markham and of the St. Cloud Electric Power Company.

R. T. Harding, San Francisco; preliminary permit; power project, Bucks and Grizzly Creeks, Plumas County, Cal.; mining and manufacturing; power capacity, 7,900 hp.; installed capacity, 15,800 hp.; in conflict with applications of Lars Jergensen and of the Great Western Power Company.

Ed. Fletcher, San Diego, Cal.; preliminary permit; power project; Santa Yzabel and Black Canyon Creeks, San Diego County, Cal.; public utility; power capacity, 1,800 hp.; installed capacity, 3,600 hp.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

Electrification of Sawmills.—A striking instance of what electrification of sawmills is accomplishing in the Northwest is afforded by the Carlisle Pennell Lumber Company, with headquarters at Onalaska, Wash. This company has made a record run in which more than 300,000 board-feet of lumber was cut on a single-cut saw in one day of eight hours. In these mills there is a total installed capacity of electrical motors of 3,200 hp., embracing 220 motors of various ratings.

Springfield, Ill., Votes to Extend Utility Franchises.—At a special election held Sept. 27 the people of Springfield, Ill., by a very decisive vote approved an ordinance extending the electric, steam and hot-water-heating franchises of the Springfield Gas & Electric Company for a period of twenty years. This is a straight extension of the company's franchises, which expired earlier in the year. The company, subsidiary of the Commonwealth Power, Railway & Light Company, also serves Springfield with gas, the franchise for which is unlimited as to its duration.

Hydro-Electricity Planned in South Carolina Through Joining Rivers.—By building a 24-mile navigable canal from the Santee River to the headwaters of the Cooper River, the Columbia (S. C.) Railway & Navigation Company plans to obtain 4,000 hp. of continuous power and perhaps three times as much secondary power. The proposal is to build a hydro-electric power house at the southerly terminus of the canal, where a head of 30 ft. would be obtained. The company has acquired a preliminary permit from the Federal Power Commission in which provision is made for surveys into the effect of the proposed diversion on the navigability of the Santee River.

Dr. Steinmetz on the Voltage of a Lightning Flash. — Addressing the Kiwanis Club of Schenectady recently on the subject of "Lightning," Dr. Charles P. Steinmetz asserted that only in the last few years, with the advance of electrical engineering, has science become able to understand and explain the electrical phenomena of the thunderstorm, to calculate the voltage and the energy of the lightning flash, and "finally we have been able to reproduce lightning experimentally in our laboratory." He said that corroborative evidence has shown that the voltage of a lightning flash was usually between 20,000,000 and 100,000,000, averaging probably about 50,000,000.

Electrification of Railroads in Japan. —Plans are being worked out by the Japanese government for the electrification of the Tokaido railroad from Tokyo to Kobe and of part of the line running from Tokyo to Kofu in the rear of Mount Fuji, where many tunnels make transportation slow. Electric trains will be for passenger service only, steam locomotives being retained for hauling freight.

Complaints of Discrimination Against San Francisco Companies.—Complaint has been made to the California Railroad Commission against the Pacific Gas & Electric Company and the Great Western Power Company charging discrimination against the Park-Presidio district of San Francisco in charges for electric service. Twnty-six residents of the district signed a formal complaint and say that they are supported by a petition signed by 3,000 consumers in the district. The complaint alleges that the rates charged in the Park-Presidio district are higher than the rates in other parts of the city in which the defendant companies are in competition with the Universal Electric & Gas Company. The petitioners ask that the Pacific and Great Western companies be ordered to lower their rates in the district to conform with the schedule in competitive territory. As an alternative prayer it is requested that the Pacific Gas & Electric Company be required to supply through the Sierra & San Francisco Power Company sufficient electrical energy at wholesale to the Universal company to permit the latter to enter the Park-Presidio district.

Formosa Developing Her Water Powers.—Since 1902, says a British consular report, five water-power electric stations have been built in the island of Formosa. These have a total rating of 11,200 hp. and supply five towns. Since the war there has been a large industrial development, and a governmental project is now on foot to utilize the waters of the Dakusui River and of Lake Candidius, which is the largest body of water in the island and lies almost exactly at its center. The cost of the undertaking is placed at 48,000,000 yen ($24,000,000 at par) and the date of its completion at about 1926. The lake, which is about 6 square miles in area and 2,400 ft. above sea level, has been gradually drying up, but when the waters of the river, which now passes within a few miles of the lake as it flows to the sea, are diverted so as to discharge into the inland body of water, the level of the latter will be raised 75 ft. A power station will be built 1,100 ft. below the reservoir, and it is expected to generate a maximum of 140,000 h.p. Eventually a second power house, with a maximum output of 62,000 hp., may be built 4 miles below the first one. A less ambitious project is now being carried out by a private company which in a few months will be capable of adding 10,000 hp. to the island's supply, and various other schemes are the subject of discussion.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Telephone Pioneers of America.—The Telephone Pioneers of America will meet at St. Louis on Oct. 24 and 25.

Vancouver Section, A. I. E. E.— Officers of this section elected for the year beginning this fall are: Chairman, John R. Read; secretary, W. F. McNeill; executive committee, Frank Sawford, L. P. Philpot and T. H. Crosby.

"Cost Accounting from the Engineering Standpoint."—An address on this subject will be made on Monday, Oct. 24, at 8 p. m., before the Philadelphia Section of the Taylor Society by John H. Williams, New York manager for Day & Zimmermann.

A. I. and S. E. E., Philadelphia Section.—The second meeting of this section of the Iron and Steel Association is scheduled for Saturday, Nov. 5, at the Engineers' Club, Philadelphia. The topic selected is "Operation and Care of Power Transformers."

American Electric Railway Association Elects Officers.—The following officers were elected by the American Electric Railway Association at its annual convention in Atlantic City, N. J., last week: President, Robert I. Todd, president Indianapolis Street Railway and Terre Haute, Indianapolis & Eastern Traction Company; first vice-president, Britton I. Budd, president Chicago Elevated Railways, Chicago, North Shore & Milwaukee Railroad and Chicago Interurban Traction Company; second vice-president, C. D. Emmons, president United Railway & Electric Company, Baltimore; third vice-president, J. N. Shannahan, president Newport News & Hampton (Va.) Railway, Gas & Electric Company; fourth vice-president, Frank R. Coates, president Community Traction Company, Toledo Ohio; treasurer, Barron G. Collier.

Coming Meetings of Electrical and Other Technical Societies

N. E. L. A., Southeastern Section—Chattanooga, Tenn., Oct. 17-19. (For program see issue of Oct. 8, page 743.)

A. I. E. E., New York Section—New York. Oct. 19.

Telephone Pioneers of America—St. Louis, Oct. 24-25.

American Society for Testing Materials—Providence, Oct. 28 and 29.

A. I. and S. E. E., Philadelphia Section—Philadelphia, Nov. 5.

A. I. E. E. and Society of Naval Architects and Marine Engineers — New York Nov. 17.

American Physical Society—Chicago, Nov. 25-26.

Electrical Supply Jobbers' Association, Atlantic Division—Philadelphia, date in November to be fixed.

American Institute of Chemical Engineers —Baltimore, Dec. 6-9.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Increase of Rates Permitted to Improve Service.—Allowing an increase in gas rates over the protests of a city which alleged inferior service, the Washington State regulatory body pointed out that the utility concerned had operated last year at a loss and expressed the view that it would be harsh to deny it a sufficient return to prevent a deficit and at the same time compel it to spend several thousand dollars to improve its service. On evidence that the company was proceeding with the improvements necessary, the increased returns were allowed.

Interests of Consumers in Utility Dividends.—In commenting on the four expenditures that the earnings of public utilities must be large enough to cover —operating costs, taxes, depreciation fund and dividends—the Rhode Island Public Utilities Commission recently said: "It becomes at once apparent that the failure to earn sufficient to cover all of the above items means that depreciation or dividends, or both, must suffer. The consumers of the utility have a direct interest in the maintenance of proper depreciation and dividends. The former safeguards the efficiency of the plant, and the latter enables the utility to maintain its credit and have available at reasonable interest or dividend rates the new capital that is constantly required to extend and develop its service to meet the requirements of the community."

Company Has Right to Benefit by Bargain Purchase.—That the actual value of property and not the sum paid for it is the governing factor in regulation of utilities was insisted upon by the Virginia Corporation Commission in a case involving the Lynchburg Traction & Light Company. "The cost to the present owners is of no relevancy," the commission said, "in the absence of information as to the sums the property originally cost. If the present owners bought a bargain, they are entitled to profit thereby, just as the owners of private property are so entitled. Had they paid too much, as is the case with the owners of certain other utility property in Virginia, they would stand to lose and the public would not be made to suffer thereby. Some utilities are overcapitalized; the commission therefore pays no attention to their capital obligations and will not require the public to pay a return on securities not represented by property used in public service. In this instance the company is somewhat undercapitalized, and the fact that large dividends have been paid upon its stock in the past does not mean that its return upon the actual value of the property has been unduly large."

Discrimination Involved in Special Rate Contract.—A complaint was brought before the Pennsylvania Public Service Commission by the Apollo Steel Company against the West Penn Power Company because of rates alleged to be in conflict with a special rate contract. The commission, however, declared that a special contract giving reduced rates to a steel mill cannot be sustained on the ground that the consumer was a pioneer user of electricity in its business, that its successful operation would be of advertising value to the utility, and that it assumes the risk of interruptions in transmitting the electrical energy over a 40-mile transmission line, since these are not the distinguishing conditions and circumstances which justify a rate differential.

Dual Service Prevented as Detrimental to the Public.—In Rockton, Ill., an agreement between the Rockton Electric Company and the South Beloit Water, Gas & Electric Company stipulating that the South Beloit company should serve all future power business and the Rockton company all future domestic consumers was disallowed by the Illinois Public Utilities Commission as detrimental to the public interest because it would lead to agitation, dispute and a duplication of equipment. The consumers, the commission pointed out, might be compelled to pay a return upon the investment in two sets of line, either one of which would be adequate for the required service. The two companies were ordered to enter into an agreement by which the local company should acquire all distribution equipment of the other utility.

Tentative Increase of Rates with Provision for Refunding Excess to Customers Is Condemned.—The Railroad and Public Utilities Commission of Tennessee has held, in an application to raise telephone rates, that rates not in the nature of emergency relief should not be granted without a valuation upon which to base the return. The acceptance of a refunding bond from the company guaranteeing the return to its customers of any excess charges subsequently determined is condemned by the commission, despite the company's contention that it will suffer irreparable injury should the routine procedure be followed. "It would be," the commission asserts, "a herculean task to take up and follow through the books of the company all the transactions with a view of refunding to each individual the excess which he may have paid in each particular transaction with the compnay. When the case should have finally been completed so that an order could issue, thousands of those who might have paid the excess charges would have died, moved away or failed to keep in touch with the detailed operations of the company."

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Rate Procedure in Kansas.—Where rates fixed by the Public Utilities Commission of Kansas are adjudged to be confiscatory and set aside by a court of competent jurisdiction, the utility may, according to a decision of the Kansas Supreme Court in City of Hutchinson vs. Southwestern Bell Telephone Company, promulgate rates of its own which will be deemed legal rates under which the utility may operate until such rates are found to be unreasonable and excessive or until other rates are fixed by the commission, and rates promulgated in this manner may not be enjoined by the courts until action has been taken by the commission. (200 Pac. 301.)*

Damages Not Recoverable for Death of Electrician Who Failed to Exercise Ordinary Care.—An electrician employed by the Trenton (Mo.) Gas & Electric Company was killed through contact of a dead line on which he was making connections at a generating station with another line carrying high-voltage current which he had previously connected and which he had himself ordered to be energized. His widow recovered damages in the trial court (Egan vs. Trenton Gas & Electric Company), but the Supreme Court of Missouri reversed the verdict on the ground that the victim had not been ordered to perform the work in the manner that he did and that, as an experienced electrician, he was guilty of lack of ordinary care in so doing. (233 S. W. 239.)

Police Power of State Not Vested in Municipalities in South Dakota.—The South Dakota Supreme Court has sustained the Board of Railroad Commissioners in a suit brought against it by the city of Mitchell to annul an order increasing telephone rates over those named in the company's franchise. The court held that any delegation of police power must be clear and express and that courts should hesitate to hold either that a sovereign power of the state, such as the police power, the free exercise of which by the proper agency might be essential to the general welfare, had by implication been taken from legislative control and lodged even in part with the municipalities of the state, or that by implication the constitution had conferred upon municipalities a power through the exercise of which they might be able to confiscate the property of public utilities.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Mortimer E. Cooley, who has been elected to head the American Engineering Council of the Federated American Engineering Societies, was born

M. E. COOLEY

in Canandaigua, N. Y., on March 18, 1856, and was graduated from the United States Naval Academy in 1879. In 1881 he was detailed by the Navy Department to the University of Michigan at Ann Arbor as professor of steam engineering and iron shipbuilding, and in 1885 he resigned from the navy to accept the chair of mechanical engineering at the university, which conferred upon him the honorary degree of M. E. He became dean of the College of Engineering in 1904 and of the College of Agriculture in 1913. During the Spanish-American War in 1898 he served as chief engineer of the convoy Yosemite, which took an active and hazardous part in the naval operations. On returning to the university Mr. Cooley undertook a large amount of important appraisal work, including investigation of the 10,000 miles of Michigan railroads, valued at $100,000,000, as well as telegraph and telephone lines, plank roads and river improvements, and the evaluation of the power plants, rolling stock, stores and supplies of the Detroit street railways. His work in Michigan led the Legislature to adopt the ad valorem basis of taxation. In 1902 he assisted in the appraisal of the mechanical equipment of Newfoundland railroads and in 1903 acted as consulting engineer in the Wisconsin railroad appraisal. In 1904 he was a member of the traction valuation committee of Chicago, and since 1910 he has been in charge of appraisal of hydro-electric and steam-electric properties and railroads for the Michigan Public Utilities Commission. He has also investigated public utilities in Minneapolis, Milwaukee, Cleveland, St. Louis, Boston, New York and other cities and has served as chairman of important committees connected with the Interstate Commerce Commission and the Chicago and Pan-American expositions. In 1918-19 Dean Cooley was president of the A. S. M. E.

C. Rodman Stull, who for the past six years has been manager of the Kingston (N. Y.) Gas & Electric Company, has resigned to take up other work.

H. J. Gille, commercial manager Puget Sound Traction, Light & Power Company, Seattle, has been made a member of the industrial bureau of the Seattle Chamber of Commerce and Commercial Club, which is undertaking an important survey of industrial possibilities in the Puget Sound region.

Dr. Ernest F. Nichols, who was inaugurated last spring as president of the Massachusetts Institute of Technology, has been prevented by illness from assuming his duties, and until his recovery the institute will continue to be governed by an administrative committee. It is hoped that Dr. Nichols, whose illness is attributed to overwork, will be able to take charge by Jan. 1.

Lewis A. MacArthur, general manager Pacific Power & Light Company,

L. A. MAC ARTHUR

Portland, Ore., has been made the recipient of an honorary degree, "master of arts in public service," conferred by the University of Oregon.

W. A. Wolls, the new president of the Ohio Electric Light Association, started in the central-station business in 1889 with the Columbus (Ohio.) Edison Electric Light Company. The company was then furnishing service to the downtown section of the city through the underground Edison tube. Mr. Wolls' occupation for a number of years was that of switchboard operator, and at the age of nineteen he became first assistant engineer in charge of the operation of the plant. Spare time was devoted to the study of mechanical and electrical engineering with the intention of becoming a

W. A. WOLLS

power-station operator. Failure of health forced him temporarily into the commercial activities of the central-station company, and he developed a liking for that phase of the work and foresaw its possibilities. In 1912 he stepped out of the central-station into the merchandising field, undertaking department-store work. He found this unsatisfactory and went back to the central-station field. He is now the manager of the new-business department of the Columbus Railway, Power & Light Company. He brings energy and ripe experience to the service of the Ohio Electric Light Association that will make for better service to the industry of the state. He has seen the company he represents grow from its inception in 1883 until it now has 43,000 customers and a sale of 135,000,000 kw.-hr. per year.

Prof. Comfort Avery Adams, who was on leave of absence for the college year 1919-20 and on half leave for the college year 1920-21, and who has served as chairman of the engineering division of the National Research Council, has returned to Harvard University and will take up his full-time duties.

Frank G. Whitney, for the last fifteen years superintendent of substations, electric division, New York Central Railroad Company, has resigned to become superintendent of the Dutch Point power station of the Hartford (Conn.) Electric Light Company. A farewell

banquet was given in Mr. Whitney's honor on Sept. 22 by a hundred of his associates and fellow-employees of the New York Central Railroad Company. Mr. Whitney was presented with a handsome watch and a traveling bag as tokens of their esteem.

Dr. Elmer D. Ball has been chosen by the Secretary of Agriculture to be the first director of scientific work. The office was created in the last agricultural appropriation bill so as to provide an official who would be in immediate general charge of all research work in the department. Through Dr. Ball an effort will be made to co-ordinate and correlate the scientific work of the department in a way to make it more effective in the study of national problems having a bearing on agriculture.

C. B. Buchanan has resigned the office of vice-president and general manager in charge of operation of the Virginia Railway & Power Company, Richmond, Va., to open an office in New York City for the promotion of the "trackless trolley."

H. P. Westervelt, formerly New England district manager for the Century Electric Company, Boston, has joined the sales enginering staff of the New England Appliance Company, 514 Atlantic Avenue, Boston, representative of the Union Electric Company and of the Watson and Kimble motor manufacturers.

E. L. Windenburg, who has been appointed office manager of the Cleveland branch of the Cutler-Hammer Manufacturing Company, fills the vacancy made by the sudden death of A. F. Loomis on Aug. 2. Mr. Windenburg has been with the Cleveland office since February, 1919, when he left the aërial service of the United States Navy. He is a graduate engineer, having taken his degrees from Iowa State College at Ames.

George T. Hansen, for ten years district manager of the Allis-Chalmers Manufacturing Company at Salt Lake City, Utah, has resigned to enter private business. E. N. Greenleaf, who has been Mr. Hansen's assistant, will become the new district manager of the Allis-Chalmers Company. Mr. Hansen will devote his time after Sept. 15 to the practice of mining engineering and to looking after his mining and oil interests.

Fred O. Erickson, formerly a member of the sales department of Roth Brothers & Company, has been appointed secretary and treasurer of the Central Armature Works, Inc., manufacturer of motors and generators. In addition to acting in the above capacity he will have complete charge of the sales department. Mr. Erickson has been with the Roth company for the last eight years. Prior to that he was connected with the Westinghouse Electric & Manufacturing Company's Chicago office, where he had charge of the repair and claim department.

John Hinds has been recently elected vice-president of the Philadelphia Insulated Wire Company in charge of sales.

Edward N. Hurley, Jr., and James A. McCoy have been elected vice-presidents of the Hurley Machine Company, Chicago, the number of vice-presidents having been increased from three to five. John Proudfoot, formerly assistant treasurer of the company, was elected treasurer in succession to Mr. McCoy.

Peter S. Klees, who has been appointed general sales manager of the Tubular Woven Fabric Company, Pawtucket, R. I., has until recently been in charge of its New York City territory. In the sales field Mr. Klees has been identified for a number of years with prominent companies. He was sales manager and later vice-president of the Franklin Electric Manufacturing Company of Hartford, previous to its consolidation with the Westinghouse Lamp Company. Mr. Klees entered the electrical industry in the employ of the American Lamp Company of Philadelphia, where he remained until about 1906, when he became connected with the Franklin company as sales manager. He has taken an active interest in the work of national associations and he is also well known in the electric manufacturing field.

P. S. KLEES

Herbert Metz, for the last two years in charge of farm electric light plant advertising with the Western Electric Company, has been appointed its power and light sales manager, with headquarters at the company's general offices in New York City. Mr. Metz joined the Western Electric Company upon graduation from Penn State College in 1914, starting in the commercial student course at its big plant near Chicago. The following year he entered the advertising department in New York and, except for a year in field sales promotion work in the Rocky Mountain territory, he has since been connected with publicity work on the extensive farm electric equipment campaign which the company has been carrying on.

Obituary

Dr. Emil Arnold Budde, a well-known electrical engineer who represented Germany on the International Electrotechnical Commission in pre-war days, is dead at the age of eighty.

Arthur F. Loomis, office manager of the Cleveland branch of the Cutler-Hammer Company, died suddenly at his home on Aug. 22. He was forty-nine years old and a graduate of Lehigh University.

J. H. Lord, an electrical engineer who had had charge of the installation of electrical equipment in the Fairfield plant of the Tennessee Coal, Iron & Railroad Company, has died at Bengal, India, where he was connected with the Tata Iron Works.

Lloyd W. Chapman, industrial editor of the *Journal of Electricity and Western Industry,* San Francisco, died on Sept. 6 after an attack of spinal meningitis. He had been at his desk three days before. Mr. Chapman, who was only thirty-six years old, was born in Massachusetts and had been connected at different times with the electrolytic laboratory of the Anaconda Copper Company at Great Falls, Mont., and as chemical engineer with the E. T. du Pont de Nemours Company at Wilmington, Del. In May, 1919, he became the Pacific Coast editor of *Chemical and Metallurgical Engineering,* being transferred last February to the position named above.

Henry J. Kimman, since 1902 manager of the Cleveland plant of the Chicago Pneumatic Tool Company, died in Cleveland on Sept. 7. Mr. Kimman was born in Haarlem, Holland, in 1863. He came to America in 1870 with his parents, who settled in Chicago. He served an aprenticeship with the Adams-Westlake Company and other manufacturing concerns in Chicago and the Far West. Ambitious to engage in business for himself, he converted the basement of his home on Nineteenth Street, Chicago, into a small machine shop and carried on work there in the evenings, while he continued to work for others in the day. He designed and in collaboration with his brother, T. P. Kimman, built the first practicable portable piston air drill, known as the "Little Giant." Soon after engaging in the manufacture of air drills he became associated with E. N. Hurley, and they formed the Standard Pneumatic Tool Company in 1898. On the consolidation of pneumatic-tool interests in 1901 he became associated with the Chicago Pneumatic Tool Company as manager of the Cleveland plant. He remained in active charge of that plant until his death.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

September Construction Activity Breaks Records

AN ANALYSIS of the report of the F. W. Dodge Company on building activity during the month of September shows that new records in construction activity were set. Building contracts awarded during that month in the twenty-seven Northeastern States amounted to $246,186,000, an increase of 11½ per cent over contracts awarded during August. This is not only the largest monthly total that has been reached this year, but also the largest September figure on record. During the ten-year period previous to 1921 the average September figure is 14½ per cent below the average August figure.

Greatest increases were noted in the entire Middle Western territory and in the New York district, while New England, the Northwestern States and the Middle Atlantic States showed the usual seasonal September decline. Figures for August were given in these columns of the issue of Sept. 17.

New England's proportion of this total of $246,186,000 amounted to 6.5 per cent; New York State and Northern New Jersey accounted for 35 per cent; 13.8 per cent was taken up by the Middle Atlantic States; the Pittsburgh district contributed 16.6 per cent; 25.3 per cent came from the Central West, and 2.8 per cent from the Northwest.

Residential building still leads all other classes, amounting to nearly 39 per cent of the total in September, but of greater significance is the increase in volume of business buildings. This amounted to nearly 17 per cent of the total and is the largest monthly total in this class since June, 1920. Public works and utilities represented 14 per cent and educational buildings 11 per cent.

These figures are of such a nature that the electrical industry, it would seem, should feel greatly encouraged over the outlook for fall and winter work. They show probably, a volume of building contracted for in the neighborhood of 20 per cent in excess of that represented by a like value a year ago.

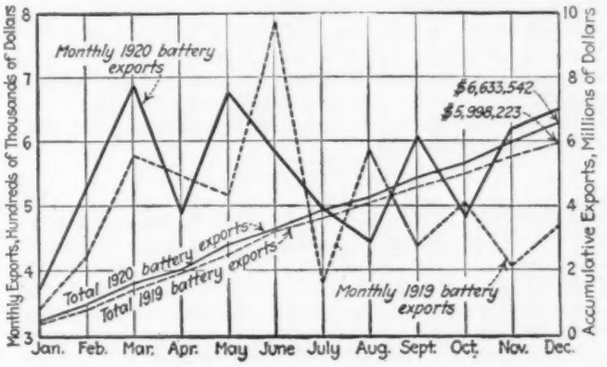
British Possessions Lead in 1920 Battery Exports

OF THE exports of batteries from the United States during the calendar year 1920, amounting in all to $6,633,542, the British possessions, including England, took nearly 51 per cent of the total, or $3,360,181 worth. Canada led all countries with $1,734,126, and England was a poor second with $467,858. From here on the decreases were quite gradual for the other countries. Twenty-five are tabulated, each of which took a value of $50,000 or more in batteries. Sixty others took batteries aggregating in value $534,398. Total exports of this commodity for the year 1919 amounted to $5,998,223.

BATTERY EXPORTS IN 1920

Canada	$1,734,126	Dutch East Indies	$93,779
England	467,858	Norway	79,407
Argentina	448,260	Denmark	72,873
Cuba	405,814	Panama	66,268
Australia	364,461	Newfoundland and Labrador	65,356
Mexico	302,046	Straits Settlements	65,115
British South Africa	250,780	Chile	63,716
British India	230,304	Colombia	58,417
New Zealand	226,896	Uruguay	56,999
Spain	205,724	Peru	52,597
Philippine Islands	195,770	Sixty countries importing less than $50,000 in batteries	534,398
Brazil	189,582		
China	147,230		
Japan	141,231		
France	114,149		
Total			$6,633,542

With the assistance of Canada the continent of North America, considering geographical divisions, stood first, with a total of $2,441,986, 37 per cent of the whole. Europe was second, five states contributing $940,011 in battery imports from the United States, 14 per cent of the total value. The islands southeast of Asia, with $881,306, or just over 13 per cent, were followed closely by South America, with $869,571, or just under 13 per cent. Four Asiatic countries took a value of $583,984, or 9 per cent of the total. The sixty other countries importing less than $50,000 each accounted for 8 per cent, and the remainder of the total went to Panama and British South Africa.


Monthly 1920 battery exports
$6,633,542
$5,998,223
Total 1920 battery exports
Total 1919 battery exports
Monthly 1919 battery exports
Monthly Exports, Hundreds of Thousands of Dollars
Accumulative Exports, Millions of Dollars
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

BATTERY EXPORT VALUES INCREASED 16 PER CENT IN 1920 OVER 1919

The diversity of the market for batteries in the foreign field is clearly shown in this table, and all the countries listed took a fair volume of imports. Of course, the item of batteries includes storage batteries, wet batteries, dry cells and flashlight batteries. Even outside of Canada, the largest market for exports of electrical equipment from the United States, it is interesting to note the volume of these imports to British domains. During the fiscal year ended June 30, 1918, Canada again was the largest importer, followed in order by England, Australia, Cuba, Argentina, British South Africa, New Zealand, France, Brazil and Mexico.

Considering monthly figures in 1919 and 1920, there seem to be no parallels in the volume of exports except that January is shown to be the poorest month. This compilation was made by the ELECTRICAL WORLD from data received from the Bureau of Foreign and Domestic Commerce.

Copper and Brass Products Higher in Stronger Market

WITH the rise in price of electrolytic copper throughout the month of September and to date in the present month it is not surprising that prices of copper products should have been advanced. Since the first of September, when electrolytic copper was quoted at 12 cents, delivered, for spot, copper wire, net, at the mill has advanced from 13.25-13.50 cents per pound to 14.50 cents. Electrolytic is now quoted 13 cents for spot, delivered. Black wire rods

have taken the same advance, high brass wire has advanced 1 cent, copper sheets and copper bottoms are ½ cent to ¾ cent higher, square copper rods are 0.67 cent higher, and round copper rods, high brass sheets and seamless copper tubing are ½ cent higher. Low brass wire is quoted 1 cent lower, and high brass rods, low brass sheets and rods, seamless brass and commercial bronze tubing are quoted ½ cent lower.

In line with these higher prices there is an increased demand for finished copper and brass products. Bare and insulated wire is quoted on a higher level this week by manufacturers who did not advance their price a week ago. During September jobbers were quoting No. 14 rubber-covered wire in 5,000-ft. lots at $6 per 1,000 ft. in several important centers of the country. Today those prices are from $6.25 to $6.60. Meanwhile the trade saw the impending advance and laid in stocks. Weatherproof, too, is higher about 1 cent in base prices.

Scrap heavy copper and wire prices since Sept. 1 have advanced from a level of 9.50-10 cents a pound to a level of 10-10.75 cents a pound. Heavy brass is up from 4.50-4.75 cents to 4.75-5.25 cents a pound. Light brass scrap is still higher at 4.50-4.75 cents as against 3.75-4 cents.

Buying of copper by wire manufacturers and by brass manufacturers has been at a high rate since Sept. 1, about 100,000,000 lb. having changed hands in the month of September. This is about double present production with most of the mines shut down.

Electrical Sheet Prices Holding, While Raw Market Is Stronger

STEEL-MILL orders are reported falling off a little during the past week. At the same time comes the announcement that several independent sheet makers in the Youngstown district have notified their customers of a five-dollar advance in sheet prices on Oct. 15. This would bring black sheets to 3.25 cents, blue annealed to 2.75 cents and galvanized to 4.25 cents, 0.25 cent in each case above the prices effective the middle of September.

Sheet production is running pretty high, one mill operating at about 90 per cent of capacity. Electrical sheet operation is on a low basis, on the other hand, in line with the buying by electrical apparatus manufacturers, with considerable stock still on hand. Prices on this material are holding, no advance having been made with the September sheet advance and no immediate advance being contemplated, it is reported, on this newly announced rise of Oct. 15.

Strong Flatiron Market Keeps Distributers' Stocks Low

A SURVEY of the markets for electrical heating devices shows the flatiron market to be the strongest of them all. Since the schedule of prices on heating devices was lowered last July the effect has been clearly shown on flatiron sales, although it was a few weeks after the price change before the consumers realized what the cut amounted to and came into the market.

Very heavy stocks were held in manufacturers' warehouses and in distributers' hands when summer broke and factory production was at a relatively low ebb for this device. Since August, however, the buying has been on such a plane that these stocks have been materially reduced and factory operation is on a fair plane again. In some quarters distributers report that they are cleaned out of stock and are actually in need of large replenishments to satisfy their customers. Other distributers are not in accord on this point. They admit that their stocks are low, but say their factory is able to make satisfactory shipments.

Distribution of irons to the consumer is said by one prominent distributer to be getting back again to the channels of trade existing before the war. That is, the ranks of the dealers that sprang up at that time and immediately after the armistice have been reduced to a large extent because of the number that have fallen by the wayside, and the trade is consequently dominated to a greater extent by the central-station companies, department stores and the better class of electric shops, thus insuring a better type of service.

Insulation Market Ruling Stronger with Better Buying

WITH the higher prices ruling for cotton yarns and cloth, the insulation market is on a little stronger basis and buying has been reported more active. The principal increase in the buying has been noted in the fields concerned in repair and maintenance work rather than in new manufacturing. Electric railway properties have shown considerable activity in this respect in the last three weeks in comparison with the light buying from that direction in the summer. Cotton insulation and cotton and rubber tapes are moving well, and a noticeable increase in buying of mica is found. This is not only in shapes for commutator slot insulation, but also in tubes and washers for grid insulation, undoubtedly in anticipation of winter needs.

Another increasing market for mica at this time is in the flatiron field, the one item of heating apparatus that is enjoying a real healthy trade. The apparatus-manufacturing field is increasing its production only slowly if at all as factory and distributer stocks have been ample to take care of the increases in buying which have developed recently for small sizes in motors and in transformers, generators, control and other electrical apparatus. Ample stocks of insulation have cared for manufacturing needs to date, but these are running low here and there and buying has resulted. From many quarters, however, the market is quite dull.

Some further price advances since Sept. 20 have been noted in varnished cotton tapes and cloth, in the nature of 10 per cent. Cotton yarns and gray goods at the mills have gone up again, and when insulation manufacturers come into the market for further supplies it is expected that still further advances in price of finished insulation will result. Then, too, stocks of cotton cloth at the mills have been reduced considerably through buying in the garment industry and a temporary shortage may result. Mica prices are up only slightly.

Metal Market Situation

COPPER buying for October and November accounts has continued at a good rate during the past week, but some producers are reported to have withdrawn from the October market because of their short stocks available. Producers' prices for October are 13 cents per pound for electrolytic, delivered, and the same price for November. December ranges up to 13.25 to 13.50 cents.

The outside market is on record as having made October sales at 13 cents, refinery, and is asking 13.12½ cents for November and 13.25 cents for December, approximately ¼ cent above producers' prices.

Buying is still good from wire and brass mills. Export sales this month have been excellent, with a price of 13 cents f.a.s. as a minimum. This will not always be covered.

NEW YORK METAL MARKET PRICES

	Oct. 4, 1921	Oct. 11, 1921
Copper	£ s d	£ s d
London, standard spot	68 12 6	69 7 6
	Cents per Pound	Cents per Pound
Prime Lake	12.50 — 12.75	13.00–13.25
Electrolytic	12.62½	13.00
Casting	12.25	12.62½
Wire base	14.00 — 14.50	14.50
Lead, Am. S. & R. Co. price	4.70	4.70
Antimony	5.00 — 5.25	5.00
Nickel, ingot	41.00	41.00
Sheet zinc, f. o. b. smelter	10.00	10.00
Zinc, spot	5.05	5.12½
Tin, Straits	26.87½	27.25
Aluminum, 98 to 99 per cent.	24.50	24.50

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	10.00 —10.62½	10.00 —10.75
Brass, heavy	4.75 — 5.00	4.75 — 5.25
Brass, light	4.25 — 4.50	4.50 — 4.75
Lead, heavy	3.50 — 3.75	3.50 — 3.87½
Zinc, old scrap	2.25 — 2.37½	2.25 — 2.37½

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for all Eastern Points

THERE seems to be no let-down in the demand for electrical materials, although some sections report no increase this week over the past. In the Atlanta district the improvement is continuing and jobbers are getting bigger orders and more of them. The trade there is looking toward the central-station companies to extend their lines as a further market for equipment. Chicago trade is quiet. The labor situation is still in a muddled state, but it is thought the light is breaking through and that the later fall will witness improvement in construction.

Building had a great impetus during September in New York, Atlanta and St. Louis territories. Electrical goods are moving well in St. Louis, with special emphasis on weatherproof wire and sockets. Hardware for pole lines and also poles increased slightly. New York trade is lively in heaters and irons.

Rubber-covered wire is somewhat stiffer as a whole, but no advance has yet been applied to armored conductor. Buying of this conductor is on an increasing curve.

NEW YORK

Improvement in trade as reported from week to week for the past month and a half continues to hold its own. No spectacular increase in activity has appeared along any line, but jobbers seem to be well satisfied with a gradual return of better conditions. Wiring material is moving steadily and demand is good. Compared with two months ago jobbers' offices present a much busier appearance, and the general attitude of both jobbers and contractors is much more optimistic. Prices show little tendency to weaken; if anything, wire, flexible armored conductor and tape have stiffened somewhat.

Heating appliances are moving better than at any time during the past six months. There has been a fairly strong demand for heaters and the leading devices such as flat-irons, toasters and curling irons. In fact, there is a decided shortage of some leading makes of the three latter appliances. Hollow ware, grills and small stoves are also moving. A great deal of interest was aroused in these appliances by the Electrical Show, which closed Oct. 8, and inquiries for all kinds of household electrical devices have been received literally by the thousands by the contractor-dealers in this territory.

Collections remain on virtually the same basis as last reported. Current sales are mostly on a thirty-day to sixty-day basis.

Conduit.—Sales have been fairly good and demand is steady, although orders are mostly for moderate quantities. The following prices were quoted: For ½-in. black pipe in 2,500-ft. lots, $54 to $55; ¾-in., $69 to $71, and 1-in., $99 to $101. Galvanized pipe in the same sizes was quoted at $59 to $62, $76 to $81 and $110 to $116. Most jobbers' stocks are fair to good in nearly all sizes.

Flexible Armored Conductor.—Active buying of this material continues, apparently in anticipation of an expected increase in price, which, however, had not been announced early in the week. No. 14, two-wire, single-strip, is quoted at $43 per 1,000 ft. and double-strip at $44.50 per 1,000 ft. in lots of that quantity. Jobbers' stocks are only fair in view of the present demand.

Rubber-Covered Wire.—Demand is a little better and contractors are ordering in larger quantities. No advance in prices was quoted, No. 14 in lots of 5,000 ft. remaining at $6.35 to $6.60 per 1,000 ft. as reported last week. For smaller quantities $7 per 1,000 ft. is asked. Jobbers' stocks are good.

Loom.—Demand for this material is very small in this territory, and only moderate stocks are carried by most jobbers. In 1,000-ft. lots the 7/32-in. size sells for $19.25 and the ¼-in. size for $21 per 1,000 ft.

Lamp Cord.—No. 18 cotton, twisted, is quoted at $12.30 per 1,000 ft. and No. 18 parallel at $14.90 per 1,000 ft. Demand is fair, and jobbers report ample stocks on hand.

Tape.—Prices are somewhat higher than last reported. Friction tape in 100-lb. quantities is quoted at 40 cents per pound and rubber tape at 45 cents per pound. Demand is fair and stocks are generally good.

Schedule Material.—Another leading manufacturer has announced a revision downward of prices and discounts on such items as sockets, receptacles, snap switches, rosettes and so forth. These conform with the prices on these items as reported a month ago. Some jobbers report a shortage on pull-chain sockets and state that manufacturers' stocks are low.

Heaters.—All jobbers reported that electric heaters are moving better, and dealers have placed orders in quantities ranging from one dozen to one gross. Stocks are moderate.

CHICAGO

The labor situation continues to muddle along, with little apparent surface indication of a final settlement. The most important development of the week was a secret meeting of the various associations representing the employers and professions interested. The Association of Commerce participated. Published reports indicate that plans were formulated to support the Landis award in the building trades situation much more strongly than heretofore. The whole situation seems to be gradually drifting toward a settlement that will not be accomplished without much creaking and groaning of the machinery and a series of apparent deadlocks.

Wire.—Little change in prices is noted and the demand is fair to good. No. 14 rubber-covered sells for $6 per 1,000 ft. in any lot required. Weatherproof is quoted at 15 cents per pound in 1,000-lb. lots. Stocks are fair for the expected future demand, but would be insufficient if a heavy demand should arise.

Flexible Armored Conductor.—Prices on No. 14 two-wire double strip vary from $48 to $50 per 1,000 ft. in lots of any quantity, depending upon conditions of credit. Movement of this line is continuing below expectations.

Rigid Conduit.—Prices on this material remain about the same as last week. Jobbers quote ½-in. black at $48 to $50 per 1,000 ft. in 2,500-ft. lots. Galvanized pipe in the same size is quoted at $52 to $54. Sales are fair and stocks are fair to good, although not much activity is expected until some settlement of the building situation is brought about.

Tape.—Demand is moderate and stocks are fair to good. In 100-lb. lots friction tape sells for 38 cents per pound and rubber tape for 40 cents.

Poles.—Stocks are heavy and moving slowly. A nominal quotation is $8.60 for a 35-ft., 6-in.-top Northern white cedar, with competition active in this line.

Locust Pins.—Movement has been very slow and stocks are still large. Prices are fairly steady, the 1½-in. x 9-in. pins selling for $38.90 per 1,000 in. lots of 3,000.

Motors.—Inquiries continue to be fair although spotted. Prices remain firm, while movement on both fractional-horsepower and large motors is slow.

Washing Machines.—Movement in this line is dependent upon the sales effort and continues to be fair. Prices are still holding with little or no expected future drop.

Heating Devices.—Air heaters are moving well, and flat-irons, toasters and grills are also moving fairly well. Stocks are fair with manufacturers' stocks reported to be only moderate.

BOSTON

Moderate increases in trade continue, with sustained activity in New England textile, paper-making and shoe-manufacturing fields. In miscellaneous electrical supplies a better tone is evident, although the machinery market is still dull. Household appliances are moving better as the dealers begin to appreciate the possibilities of the fall trade. Collections are holding up well and promise decided improvement within the next few weeks. Jobbers' stocks are much lower than earlier in the year. Prices are undergoing many readjustments, with upward tendencies in loom and rubber-covered wire. Building operations fell off about 25 per cent last week in the value of contracts placed, and the slow liquidation of labor is believed by many to be responsible for the lack of accelerated revival in this field.

Lamps.—Week by week lamps are reported in better demand. Seasonal consumption is increasing and larger business activity is also reflected in sales. Portables are moving reasonably well and sign lighting is healthier than for some time. Prices are encouraging to new business.

Wire.—No. 14 rubber-covered is moving fairly quickly at present, with sharp competition. No. 14 sells at $6 to $6.25 per 1,000 ft. in 5,000-ft. to 25,000-ft. lots and at $7.25 in lots of 1,000 ft. to 5,000 ft. In the larger quantities some instability of quotations is evident. Stocks are plentiful. Weatherproof base Monday was 14¾ cents.

Loom.—The market is dull this week, stocks being ample for current needs. Prices trend toward firmer levels, though current sales do not yet reflect this much. The ½-in. size is selling around $16.50 to $17.50 per 1,000 ft. in 5,000-ft. lots, and the ¾-in. size, correspondingly, at $19 to $20. Sales quickened Monday in anticipation of price stiffening.

Flexible Armored Conductor.—In 5,000-ft. lots this material is moving slowly around $42 per 1,000 ft. Liberal stocks are in hand.

Washers and Cleaners.—Unsettled conditions have not yet cleared in the electric washer market, owing to the divergence in prices of machines in competition. Sales are continuous, but intensive effort is needed to move goods. Better business is reported on cleaners, with more stable price conditions, good stocks and active factory production.

Meters.—Moderate improvement in building conditions is reflected in meter movement from stock. Prices hold firm.

Motors.—Spotty business continues to dominate the market. Industrial betterment work, however, keeps up a steady stream of small-order business, with ample stocks for current requirements.

Scheduled Material.—Price readjustment continue in prominent lines of plugs and switches, the tendency being downward. Pull sockets are steady at 31½ cents net, in case lots, keys at 18 cents and keyless at 16½ cents.

ATLANTA

The opinion of all lines of business is that conditions in general continue to show a steady improvement of a substantial and healthy nature. Everything seems to indicate that this section is again on the road to normal and healthy conditions. No very large operations have yet been undertaken, but reports of expanding activities have lately been received from a variety of sources, the more noteworthy being those recently announced in the textile, ice and stone working lines.

The report of the Federal Reserve Bank of Atlanta places August building permits of twenty-four principal cities at 3,506, valued at $5,814,000, an increase of 190 per cent over August, 1920. This heavy revival of construction is the cause for satisfactory activity in lumber and woodworking plants, brick manufacturing, etc. In the electrical lines it is having a tendency to overcome the hand-to-mouth purchasing that has been so much in evidence for the past few months, and contractors are now beginning to feel safe in accumulating small stocks of the faster moving materials.

Funds realized for fall crops are beginning to be evidenced in the increase in retail sales. Electrical jobbers are enjoying considerable increase in the number and size of orders from the contracting trade, and they are anticipating considerable revival in purchases by central-station companies for line material for maintenance and expansion.

Fixtures.—Both the commercial and residential types continue exceptionally active, owing to the large number of buildings going up in Atlanta and vicinity. Jobbers say they have stocks sufficient to meet the demand. While there have been reductions in some types, prices in general remain steady.

Poles.—The demand for poles of all varieties continues very satisfactory, with jobbers reporting white cedar and chestnut poles as increasingly active. One of the largest jobbers reports the receipt of heavy inquiries for poles from central-station companies during the past week. Stocks of the better class are fair to good, with shipments from yards fairly prompt.

Pole-Line Hardware.—The entire line of pole-line hardware continues active with prices steady, there having been no change for the past sixty days. Stocks are ample.

Bell-Ringing Transformers.—Jobbers report a steady and very satisfactory demand for this specialty, with prospects of it continuing for some months to come. Stocks are in good shape with no price change reported.

Safety Switches.—The movement of this line continues very good with the 30-amp., three-pole type the most popular, though sales of all sizes are becoming more satisfactory. Stocks are good.

Sewing Machines.—There has been little or no activity in this line for some time past. Jobbers are not placing orders for fall as they do not anticipate any increased activity for some time.

Farm-Lighting Plants.—After several months with few or no sales recorded the past few weeks have witnessed an awakened interest in this line. Several of the manufacturers and jobbers will exhibit at the county fairs this month, and they are anticipating considerably increased sales.

ST. LOUIS

Building permits for the city of St. Louis were of abnormally large value last month, the total being reported as $4,307,172, but permits were issued for only three new factories and workshops, and their value was only $42,500. The principal items were a million-dollar hotel, a million-dollar lodge building, a hospital to cost $600,000 and two schools totaling $260,000.

The buying of electrical goods continued to show slight advancement last week, no particular line of goods finding especial demand. Buying of weatherproof wire in larger quantities by the utilities was of interest, and the railroads also showed somewhat better buying strength. The situation in the South is being closely followed by all the jobbers, but as yet only a slight increase in purchasing is apparent. Money in the South is now easier to obtain, and materially better business, especially in appliances, is expected to develop in the next few months.

Non-employment, although declining slowly, will be strongly felt here this winter, and to alleviate conditions a committee has been appointed to study the situation and make recommendations. The first of these is for the city to engage in municipal improvements on a large scale, and the indications are that something of the kind will be done.

Wire.—Further stiffening of prices occurred last week, and now most jobbers are selling No. 14 rubber-covered for $6.50 per 1,000 ft. in lots of 5,000 ft. or more. The base price on bare and weatherproof is from 15¼ cents to 16 cents per pound. One of the railroads purchased a large quantity of No. 9 bare, and a number of the utilities came in for good quantities of weatherproof. Some stocks are running low.

Flexible Armored Conductor.—The market is weak and no material changes in prices have been made. No. 14 two-wire is $5 per 100 ft. in lots of 1,000 ft. or more.

Lamp Cord.—A slight shading in prices over those of the preceding week is apparent, and No. 18 cotton-covered twisted pair is being sold for $13.25 in lots of 1,000 ft. The demand is showing improvement and stocks are slowly being reduced.

Knobs and Tubes.—Price increases have been generally made as the stocks obtained at the lower manufacturers' prices became exhausted. In barrel lots "Nail-It" knobs are priced around $17.50 per 1,000. Likewise, in barrel lots, 2½-in. tubes are selling for $5.25 per 1,000 and 3-in. tubes for $5.75 per 1,000. Low stocks are being maintained.

Conduit.—While the movement continues slow, particularly in the larger sizes, the week developed some improvement. Stocks are in good condition. In bundle lots ½-in. black sells for $49.75 per 1,000 ft. and 1-in. black for $93.16. In the galvanized the respective prices are $55.93 and $103.36.

Sockets.—Some improvement in buying is reported and a steady volume of sales has been maintained for some time. Representative prices are: Key, $18.15 per 100; keyless, $16.15, and pull, $33.00, all in standard-package lots. Stocks are in excellent condition.

Pole-Line Hardware.—Improvement is found as compared with the slack sales existing a few weeks ago. The sales indicate that the utilities are buying only for small extensions and for maintenance purposes. Quite a bit of line strengthening is being done in anticipation of the winter.

Poles.—Some variations in the prices on Western red cedar poles have been made, but they are small and cover only changes which have been made in freight charges, the variations depending upon the shipping base. The demand is increasing slightly, most of the improvement being in Illinois and Arkansas.

SEATTLE—PORTLAND—SPOKANE

The business tone in the Puget Sound and Portland districts is greatly improved over that of six weeks ago, and the marked gains made in September are apparently permanent. Conditions are better in the lumber industry than they have been during the past two years, and it appears that the corner has been rounded. The lumber market in the Seattle district has stiffened considerably during the past week. Fir lumber had advanced about $2 per 1,000 ft. with export business heavy. Lumber and wheat exports from Portland were unusually heavy during September. An average of more than 2,000,000 ft. of lumber and approximately 200,000 bushels of wheat was shipped each day during the month. Imports are increasing steadily.

Building of residences and small industrial and commercial building continues good in both the Portland and Seattle districts. Wages in the building trades are on the average about 20 per cent lower than a year ago. Electrical jobbers of Seattle report business to be holding the gains made during September, and a steady growth is anticipated. Some loosening of credits is observed. Few price changes are observed, but some slightly upward tendencies have been noted. Stocks for three months are carried in most lines, and shipments are fairly normal. Portland manufacturers and jobbers report the volume of business to be good, but mostly in small sales. Jobbers are carrying about four months' stock of goods that must be supplied from the East. There is pronounced activity in the sale of washing machines and ironers. A recent drop of 15 per cent or more in the price of washing machines has undoubtedly done considerable to influence this activity. Some retailers report business very active.

Electric Washers.—Following the slashing of prices effective Oct. 1, washers have been moving rapidly in Seattle. Dealers have taken advantage of the price reduction by instituting aggressive selling campaigns with good results. Washers now range in price from $120 to $140.

Heaters.—Owing to the low rate for energy used for heating in Tacoma a considerable market for 2-kw. and 3-kw. heaters exists. The movement for heaters is now under way and promises to be good for several months.

Hollow Ware.—Specialties are beginning to feel the influence of the fall and holiday season and are livening up considerably.

Wire.—The price of copper wire has stiffened slightly during the past week. Rubber-covered is up 5 per cent while 0.5 cents has been added to the base price of weatherproof.

Schedule Material.—Since the reductions in the price made effective a few weeks ago the movement in schedule materials has been very good.

SAN FRANCISCO

The oil-field strike still drags along, but it is likely an early settlement will be reached. Collections are better than they were a month or so ago, and credit men are again loosening up the amounts allowed their customers.

Schedule Material.—Standard brass key sockets are selling in package lots for approximately 20 cents each. Lower prices made on all standard sockets as well as on other standard schedule items are causing a demand which is reflected in good movements of stocks as reported by manufacturers maintaining schedule stocks on the Coast.

Heating Devices.—Jobbers' salesmen are now out on Christmas stock solicitation, but the first orders will be very low compared with last year because of long stocks remaining in the dealers' hands on items considered as particularly of a holiday character. Some heating pads retailing at $9 each have proved acceptable to the trade at $5.85 in lots of six. It may be generally said that the 1921-22 heating pad demand will be principally confined to low-price articles. Some dealers have thought so highly of the possibilities of instantaneous water heaters that they have put out special solicitors for them, and it is certain that there is a big public demand for the right heater.

Conduit.—Non-metallic flexible conduit, which has decreased about 10 per cent in price, is now selling for about $19 per 1,000 ft. in the standard wiring size. Local stocks are good.

Wire.—Local stocks in all standard sizes are very low. In rubber-covered wire some exceedingly low prices and a special drive have pretty well exhausted the local market. Prices are now on the upward trend, the new 5,000-ft. price on No. 14 single-braid solid being $7 per 1,000 ft., an increase of about 10 per cent.

SALT LAKE CITY—DENVER

A feeling of decided optimism, warranted by actual improvement in business generally, has developed in the merchandising field in the past three or four weeks. Crops are being liquidated, and the farmers are spending their money for the things they have long needed. The beginning of the beet harvesting has begun, and the first pay day, several weeks hence, will put hundreds of thousands of dollars in circulation. Electrical men, both jobbers and dealers, are noting positive indications of better times and dealers report a better buying tendency on the part of the consumer of electrical merchandise. Dealers are ordering stocks in better quantity. Money seems to be getting gradually easier, with collections showing some improvement.

The report comes through reliable channels that one of the largest smelting concerns in the mountain region will soon resume operation, taking back on its payroll 700 men. The employment situation generally, however, is not much improved, although an effort is being made by several agencies to co-operate with the federal government. The electrical repair business has been exceptionally good through the summer.

Flatirons.—A gratifying improvement in sales is reported, with jobbers in many cases far behind the demand for stocks. Reduced prices, together with vigorous advertising campaigns, are responsible for the pick-up in business.

Headlight Heaters.—The consumer demand is good and jobbers are adequately stocked.

Ranges.—The inauguration of financing plans whereby dealers can handle time payment contracts has resulted in better sales of electric ranges.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

New Manufacturer Enters Insulation Field in Delaware

The Insulation & Specialty Corporation of America, 3154 Dupont Building, Wilmington, Del., on Sept. 1, 1921, was organized with a capital stock of $500,000 to manufacture "Fibre Granite" insulation. This comes in sheets, rods, tubes and special shapes. It is announced by P. C. Hennig, president of the company, that on Oct. 1 the capital stock was increased to $1,000,000.

The plant will consist of three concrete buildings, 60 ft. x 200 ft., boiler house, engine house, office building and shipping room, 80 ft. x 100 ft. There are about ten acres of land and railroad sidings. It is stated that the plant will give employment to from 400 to 500 men.

P. C. Hennig is president and chairman of the board of directors, W. L. Broman is vice-president and Lawrence J. Broman secretary and treasurer.

Majestic Electric Development Pushing Convenience Outlet

One of the few manufacturers of electrical socket devices and appliances who are pushing the campaign for the "convenience outlet" is the Majestic Electric Development Company, 656 Howard Street, San Francisco. In a recent letter T. D. MacMullen, sales manager of the company, states that it is the company's policy to draw attention to the use of the convenience outlet in all of its advertising, and an attached bulletin, distribution of which was estimated to have reached close to half a million copies, featured this policy. A window of one of the San Francisco electric companies was shown wherein every portable appliance was connected to a convenience outlet. This is in support of a campaign of publicity started some time ago to push the convenience outlet, but up to date assisted very little by the manufacturers of portable appliances.

Black & Decker Establishes National Credit Service

The Black & Decker Manufacturing Company, Baltimore, has recently put into effect what it terms The Black & Decker National Credit Service. The company's products are sold entirely through jobbers, and the new service enables customers to buy through their regular jobber by paying 23 per cent of the regular price of the item in cash, balance in six equal monthly payments. Jobbers have been supplied with printed forms to be used for orders taken under this plan. These order forms are conditional sale agreements which make the item sold its own security until entirely paid for. The jobber forwards these orders to the company, which discounts them for the jobber, so that every sale made under this plan is in effect a cash sale for the jobber. The company shares fifty-fifty all responsibility with the jobber for the fulfillment of sale agreement.

Refrigerator Manufacturer Keeps Up to Year's Bogey

George Spalt & Sons, Inc., Albany, New York, makers of the "Powrkold" iceless refrigerators, have kept their sales this year up to the "bogey" set for them last year. The company is selling now directly through its factory and has been for the last two years, but, having brought its refrigerating machine to its present state of development, it is expected that distributer connections will be made about the first of the coming year.

Cuban Telephone Issue to Provide for Enlargements

The Cuban Telephone Company has released an issue of $4,000,000 of 7½ per cent gold bonds, series A, due in 1941, the offering price being 95 to yield 8 per cent. Proceeds from the sale of the bonds will be used, it is reported, for liquidating the entire floating indebtedness of the company and in addition will provide for extension enlargements to its telephone system.

Locke Changes New York Manager and Office Location

On Oct. 1 the New York City office of the Locke Insulator Manufacturing Company was removed from the Woolworth Building to the twenty-first floor of the Equitable Building, 120 Broadway. A month before this change C. H. Wheeler took over charge of the New York territory from Kent Hawley, who returned to the factory at Victor, N. Y., as chief engineer. Mr. Wheeler has been for nineteen years with the General Electric Company. Seven years of this time was spent at Schenectady, and since 1909 he has been in the general office in New York.

The Victor plant is running at fair capacity, not because of a few large orders, but by virtue of a great many small orders, indicating a rather healthy policy of central-station line extensions, although these may be of short length.

Return of Buying Conditions Shown in Success of New York Electrical Show

Reports Received from Exhibitors State Results Were Beyond All Expectations, Sales of One Company Going to $100,000 —Follow-Up Addresses Secured

That the fourteenth annual Electrical Show, held in the Seventy-First Regiment Armory in New York City on Sept. 28 to Oct. 8, was a distinct success is well attested by the reports of the exhibitors at the show. The public is again interested in electrical goods and equipment, and actual sales made indicate the return of better conditions and give hope for a good winter.

The attendance totaled about 100,000 paid admissions, besides passes, and the important feature of this is the common report that this attendance was made up of a higher type and better educated class of people than in the past. There was little hesitation on their part to give name and address so that sales could be pushed at a later time, a reversal of past form. The success of the show was beyond expectations on the part both of the retailer and the manufacturer and distributer.

Business booked was more than satisfactory, according to reports of the exhibitors. Although it was characterized as a household-appliance show, returns to date mention sales of one 5-ton and one 2-ton electric vehicle. Export business, too, was not lacking.

One dealer and importer of electrical glassware reported $28,000 in orders booked, half of which was on one order, and none of which he would have expected to get through regular channels. Motor-driven household appliances sold very well, one manufacturer reporting orders for well over 5,000 washers. A manufacturer of dishwashers reports more than seventy sales, and other manufacturers report in similar vein. Electric ranges and stoves also came in for satisfactory sales. The maker of a violet-ray machine reports retail sales of over 500 and total sales, including export business, of about $100,000.

An attraction that was very popular was the receipt of the world's series baseball game scores in the afternoons through the medium of the radio telephone with loud-speaking attachment. In the evening concerts were transmitted.

Francke Company Extends Line of Flexible Couplings

On Sept. 1 the line of flexible shaft couplings for direct-connected machines manufactured by the Francke Company, New Brunswick, N. J., was extended to take in the small light-duty motors from 1 hp. to 50 hp. or 75 hp. At the same time, a reduction in the price of couplings was announced by Smith & Serrell, Newark, N. J., general sales agents for the Francke Company. A new bulletin contains brief outline on operation characteristics of direct-connected machines.

Magee Furnace Now Has Wide Electrical Distribution

The Magee Furnace Company, Boston, manufacturer of coal and gas ranges for many years, has just completed plans for a very wide distribution of its electrical range equipment. The company is now manufacturing "Electricoal" ranges, a combination range burning both coal and electricity, or coal, gas and electricity. Besides its combination ranges the company also makes oven attachments and end-shelf attachments for its regular models of coal ranges.

Recent advices state that the electrical stove department is running 100 per cent capacity at this time. Since the first of July the following distribution points have been opened up, the Canadian ones having just been completed: San Francisco, Philadelphia, Cincinnati, Toledo, Detroit, Chicago, York, Milwaukee, St. Paul, Buffalo, Rochester, Albany, Omaha, New York and Boston. Montreal, Halifax and St. John have just been taken as distribution points in Canada.

More Boxing and Crating Courses to Be Given

Notice has just been received of another series of courses in boxing and crating at the Forest Products Laboratory, Madison, Wis., under the direction of the United States Department of Agriculture. These courses run for five and one-half days and will begin on Nov. 7, 1921, and Jan. 9, March 6 and May 1, 1922. The object is to demonstrate the principles that underlie proper box and crate construction and to supply information which will be of assistance in developing economical containers that will deliver the contents in a satisfactory condition at a minimum cost.

American Bosch Occupies New Building for New York Office

The American Bosch Magneto Corporation, Springfield, Mass., is now occupying four floors of the new ten-story building which it completed this summer at 17-23 West Sixtieth Street, New York City. There will be a large service station and installation garage in the basement, and the sales and stockrooms which will occupy the ground floor have been laid out with high ceilings and large show windows. The company outgrew its former quarters at 223 West Forty-sixth Street, after it brought out its new starting and lighting system, battery ignition system and spark plugs and after it took over the sale of the Gray & Davis starting and lighting system and automobile lamps.

Shipments Not Affected by American Line & Material Fire

About the middle of September the American Line & Material Company suffered a loss of approximately $100,000 through a fire which destroyed some of the stock in its yards just outside of South Norfolk, Va. According to advices from the president of the company, the property destroyed consisted of cross-arms, pins, wooden conduit and planking which was piled in the yards and in two sheds, and no damage was done to the manufacturing plant or to the office building. Manufacturing is being conducted as usual in the company's creosoting plants.

The Crane Company announces that it will soon transfer the manufacture of its brass valves and other products to the Chicago plant, leaving the Bridgeport (Conn.) plant free to handle the iron production. This latter plant recently increased its operations from three days per week to a four-day schedule.

The American Steel & Wire Company, 208 South LaSalle Street, Chicago, announces the appointment of E. E. Aldous as its representative in the St. Paul-Minneapolis-Duluth territory, with headquarters at St. Paul. Mr. Aldous has been connected with the company for twenty years in different positions.

The F. Rosenberg Elevator Company, 174 Reed Street, Milwaukee, has awarded the general contract for construction of its proposed new plant at Franklin and Becker Streets and the Chicago, Milwaukee and St. Paul railroad tracks. The building will be one story, 120 ft. x 223 ft., and the cost of construction with equipment will be about $100,000.

Foreign Trade Notes

PROPOSED CHANGES IN ELECTRIC PLANTS IN BRITISH EAST AFRICA.—Plans are on foot in Nairobi, British East Africa, it is reported, to organize a new company to take over the franchises of the Nairobi Electric Power & Light Company and the Mombassa Electric Company. The combined plan, it is understood, involves the development of a moderate-sized water power a short distance from Nairobi, in addition to the present one operated by the Nairobi company.

DUTCH INDUSTRIES FORM CLEARING HOUSE FOR DUTCH EAST INDIAN INFORMATION.—A step of importance is announced as having been taken by various enterprises engaged in the development of the Dutch East Indies by the establishment in The Hague of a "Council of Economic Initiative for the Netherlands Indies." The object of this organization is the formation of a permanent institute to serve as a clearing house for the study of questions affecting the general interests of different undertakings and industries in the Dutch East Indies. By concerted action when necessary of the various enterprises which have joined the new organization, it is proposed to foster the interests of the respective members in matters that affect their common development and welfare. During the year 1920 the Dutch East Indies imported electrical equipment from the United States to the value of $1,425,435, the leading items being telephone equipment, motors, insulated wire and cable, batteries, dynamos and generators, switches and accessories and transformers.

ALLIANCE OF MANUFACTURING COMPANIES IN JAPAN — The Nippon Electric Company, an allied company of the International Western Electric Company, New York City, and one of the oldest concerns with participating foreign capital in Japan, has joined forces with the Sumitomo Electric Wire & Cable Works, Osaka, one of the oldest commercial enterprises in Japan. A new company has been organized, known as the Sumitomo Electric Wire & Cable Works, Ltd., for the production of power telephone and telegraph cables. It has started with a capitol of 10,000,000 yen, or about $5,000,000. Under the provision of the alliance, the Nippon Electric Company has granted to its new associates the right to use all the manufacturing and engineering information and patents which it receives from the Western Electric Company covering the production of cable. The Sumitomo company, which is primarily a manufacturing concern, has on its side agreed to assist the Nippon company in the sale not only of electric wire and cable but also of all its other products. As a point of historical interest, the house of Sumitomo is one of the oldest banking and commercial organizations in the empire, its activities dating back to 1690. Baron K. Sumitomo is one of the heads of the company, and he will have associated with him in the new enterprise K. Iwadare, managing director of the Nippon Electric Company.

PROPOSED ELECTRICAL DEVELOPMENTS IN CHINA.—Four electrical undertakings, according to the *Far Eastern Review*, have recently been registered with the Chinese Ministry of Agriculture and Commerce, as follows: The Shou-shing Telephone Company, Shou-Shing, Chekiang; the Jui-An Electric Light Plant, Sui-an, Chekiang; the Chowshan Electric Company, Chowshan Chekiang, and the Sun Fong Electric Company, Kiangsu. Other electric companies that have been organized are the Yau Tai Electric Light Company, Tai Hsin, Kiangsu, and the Sing Yang Electric Light Company, Sing Yang, Honan. Chen Yi-hee, president and organizer of the Sunning Railway, the same publication reports, is planning to organize a company with a capital stock of $2,000,000 to develop a water-power project near the town of Sunning. As was the case in the construction of the Sunning Railway, it is proposed to obtain the money for this water-power enterprise from former residents of the Sunning district who are now living in the United States.

TELEPHONE EXTENSION IN SPAIN.—The Director of Communications of the Spanish government, according to a report from Commercial Attaché Cunningham of Madrid, Spain, has ordered the establishment of telephone exchanges in thirty-five towns. This will involve the purchase of a considerable amount of telephone material, but no details are available as to what will be required or when bids will be invited.

ELECTRIFICATION OF RAILWAY IN JAVA.—In connection with the extensive hydro-electric developments in the Dutch East Indies it is reported that the electrification of the steam from Meester Cornelis to Tandjong Priok will be started in the near future. No details as to the technical plans of the work are available.

SUBSIDY FOR ELECTRIC FOUNDRIES IN BRAZIL.—The Brazilian Parliament, in order to encourage the use of electric foundries in Brazil, according to the *Electrician*, is considering granting a subsidy of 200 contos of reis (£10,000) to each of the first three electric foundries to be established in Brazil.

HYDRO-ELECTRIC POWER PROPOSED FOR VIENNA, AUSTRIA.—The municipality of Vienna, in conjunction with a banking syndicate, is organizing a company with a capital stock of half a billion crowns to develop water power on the River at Ybbs, near Vienna, sufficient to supply the city with electricity. The cost of construction will be covered by an issue of bonds aggregating 10,000,000,000 crowns,

one-third of which will be issued in the first five years. Plans for the preliminary work, which will start in October, must be completed by June, 1926.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

A firm of merchants in India (No. 125) dealing in precious metals desires to get into touch with manufacturers for the purchase of machinery for melting copper and brass household utensils, casting into ingots and rolling into sheets and bars, and for making wire.

A commercial agent in the United States (No. 136) who has trade connections with firms in Mexico desires to secure an agency from manufacturers for the sale of electrical appliances, etc.

PROPOSED HYDRO-ELECTRIC DEVELOPMENTS IN SPAIN.—Hydro-electric projects to develop a total of more than 750,000 hp. are under consideration in Spain at the present time, according to a recent report of Commercial Attaché Cunningham of Madrid. Of these the Douro enterprise is the most important and is expected to develop about 450,000 hp. This project is being financed by the Bank of Bilbao and Vizcaya, the capital for which is said to be entirely Spanish. A list of projects under consideration, with the addresses of the promoters, may be obtained upon application (File No. 48,376) to the Western European Division, Bureau of Foreign and Domestic Commerce.

PATENT FOR ELECTRIC DEVICE OFFERED TO AMERICAN MANUFACTURERS.—Ugo Cantutti, electrical engineer employed on the Italian State Railways, through A. A. Osborne, assistant commercial attaché at Rome, Italy, has submitted to the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., a patented method for preventing sparking at the brushes of direct-current apparatus. Mr. Cantutti wishes to get in touch with some American manufacturer who will take over his patent in the United States; the idea has been patented in Italy. Information concerning the method, together with several small blueprints, is on file at the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce.

EXTENSION TO TELEPHONE SYSTEM IN ATHENS.—To meet the increasing demand for telephone service, the committee of technical experts appointed by the Greek Ministry of Communications has recommended the installation of a new central station capable of serving 10,000 subscribers. The committee also recommended replacing the present overhead wires with subterranean cables. Inasmuch as the committee believes that four years will be required to complete this work, it has advised that, to meet the emergency, the present system of overhead wires be continued and the switchboard be increased from 1,600 to 5,000 telephone connections, and has asked bids for this work. At the same time bids are requested for the large central station, which will accommodate 10,000 subscribers. Bids must be submitted to the Ministry of Communications, Athens, Greece.

New Apparatus and Publications

FLEXIBLE COUPLINGS—Smith & Serrell, Newark, N. J., general sales agents for The Francke Company, New Brunwick, N. J., announce bulletin No. 32, showing the new line of Francke flexible couplings for motors up to 75 hp.

ELECTRIC HEATERS—The Hale Electric manufacturing Company has a new folder on its electric air heater.

REFRIGERATOR—George Spalt & Sons, Inc., Albany, N. Y., have issued a bulletin on their "Powrkold" iceless refrigeration.

ELECTRIC HAIR CUTTER—The P. A. Geier Company, Cleveland, has developed an electric hair cutter, the "Royal."

SEWING MACHINES—The Singer Sewing Machine Company, Bridgeport, Conn., has a booklet out on its new electrically driven chain stitch sewing machine and on its new No. 101-2 "motor-in-head" sewing machine.

BOILER METERS—The Bailey Meter Company, East Forty-sixth Street at Euclid Avenue, Cleveland, has issued bulletin No. 42, entitled "Bailey Boiler Meters," superseding No. 41, and bulletin No. 160, entitled "Multi-Pointer Gages for Draft and Other Factors."

ELECTRIC RANGES—The Magee Furnace Company, Boston, has issued two new bulletins, one entitled "Magee Electricoal" and the other "Magee Electrifies Every Range."

ELECTRIC IRONER—The Hoe Corporation, Poughkeepsie, N. Y., is circulating a publication on its new electric ironers for family and institutional use.

AIR COMPRESSOR—The "Imperial Type XCB" is a new motor-driven air compressor recently developed by The Ingersoll-Rand Company, 11 Broadway, New York.

SHAFT COUPLINGS — The Hilliard Clutch & Machinery Company, Elmira, N. Y., has some new shaft couplings on the market.

ELECTROCATOR — S. M. Hanson, 601 Washington Street, Lynn, Mass., has developed a device, the "Electrocator," for facilitating the exact location of a given point in machine-tool work.

BENCH DRILL—A small portable bench-drilling machine has been placed on the market by the Model Specialty Company, 401 East Nineteenth Street, New York.

TRAVELER'S IRON—The Simplex Electric Heating Company, Cambridge 39, Mass., has placed on the market a new .3½-lb. traveler's electric iron, (No. 1914).

CURRENT TAP — Bulletin No. 17-4 describes the new "Te-Cap" current cap of Harvey Hubbell, Inc., Bridgeport, Conn.

PLUG FUSE—A clear-window plug fuse, the "Protex," has been put on the market by The Protex Fuse Works, 1623 East Forty-third Street, Cleveland.

DISHWASHER—The Crescent Washing Machine Company, New Rochelle, N. Y., is marketing a new electric dish-washing machine.

CHURN—The Taylor Brothers Churn & Manufacturing Company, St. Louis, is marketing a new motor-driven churn.

FIRE EXTINGUISHER—The Foamite Firefoam Company, 200 Fifth Avenue, New York, is making a new splash-proof fire extinguisher the U. S. No. 2½ of 2½ gal. capacity.

COMMUTATOR TRUING DEVICE—Jordan Brothers, Inc., 74 Beekman Street, New York, have issued a new data sheet covering their commutator truing device.

OVERLOAD RELAY.—An overload relay, "Merco," designed to protect alternating-current motors has recently been placed on the market by Brown & Pengilly, 607 East Fourth Street, Los Angeles, Cal.

CONNECTOR.—The E & B Manufacturing Company, Fort Street and Mount Elliott Avenue, Detroit, has recently brought out a "Snap" connector for flexible cable.

TREE INSULATOR.—The "Barnes Universal" tree insulator, designed to protect high-voltage distribution wires, has been developed by the National Electric Corporation, Whitman, Mass.

CIRCUIT EXTENDER.—The M. Propp Company, 524 Broadway, New York City, has developed a new device, known as a "circuit extender," which allows a number of sets of Christmas tree lights to be attached to a single circuit. It can also be used for connecting floor and table lamps and household appliances, etc.

TAP SOCKET. — The E. H. Freeman Electric Company, Inc., 803 East State Street, Trenton, N. J., has recently placed on the market a pull-chain current tap socket designated as No. 680.

AMPLIFYING TRANSFORMER. — The General Radio Company, 11 Windsor Street, Cambridge, Mass., has recently developed an amplifying transformer (No. 231A) adapted particularly for use with vacuum tubes in radio work.

CABLE AND CONDUIT.—The Eastern Tube & Tool Company, Inc., 41 Gardiner Avenue, Brooklyn, N. Y. has placed on the market an "Ettco" single-wall, flexible, non-metallic conduit and a steel armored conductor for either two or three wires.

RANGE.—The Walker & Pratt Manufacturing Company, 35 Union Street, Boston, is marketing an electric range with an adjustable broiler.

New Incorporations

THE KALONEKA ELECTRIC LIGHT & POWER COMPANY, Caroga, N. Y., has been incorporated with a capital stock of $15,000 by W. J. and C. Dandusen and O. J. O'Neil

THE INTER-CITY TELEGRAPH COMPANY, New York, N. Y., has been incorporated by R. A. Adams, F. A. Hinners and K. L. Zimmerman. The company is capitalized at $50,000 and proposes to operate a local telegraph system. L. Oppenheimer, 60 Wall Street, represents the company.

THE AIR COMPRESSOR & EQUIPMENT COMPANY, has been incorporated at Portland, Ore., to manufacture and assemble air compressors. Guy S. Malcom, George Larrabe and W. E. Thomas are directors.

THE BURLINGTON (ILL.) ELECTRIC COMPANY, has been organized with capital of $3.000 to supply light for the village. A transmission line will be built from Hampshire, Ill., to Burlington, and power will be purchased from the Northern Illinois Utilities Company. Address L. F. Kinef, Burlington, Ill.

THE NATIONAL GENERATOR COMPANY, New York, N. Y., has been incorporated by W. W. Harris, W. C. Swift and S. Null. The company is capitalized at $500,000 and proposes to manufacture electric and steam generating equipment. W. J. Bloch, 317 East Eighteenth Street, represents the company.

The COILITE CORPORATION, Utica, N. Y. has been incorporated with a capital stock of $100,000 to manufacture electric lighting fixtures and kindred equipment. The incorporators are G. R. and D. A. Hughes and J. Rothstein, Utica. The company is represented by Dunmore, Ferris & Dewey, Utica.

THE RADIO DEVELOPMENT CORPORATION, Springfield, Mass., has been chartered with a capital stock of $25,000 to develop and manufacture electrical devices, especially radio appliances. The officers of the company are: Frank W. Sickles, 683 South Main Sreet, president, and A. Raoul Silber, 39 Spruceland Avenue, treasurer.

THE HUGHES ENGINEERING & CONSTRUCTION COMPANY, 316 West Redwood Street, Baltimore, Md., has been incorporated by Charles H. Gunther, Charles C. Swegler and Theodore J. Robinson, to manufacture engines, power-house equipment and other machinery.

THE DAVIS LIGHT & POWER COMPANY, Galesville, Wis., has been incorporated by Ben W. Davis, Alfred N. Sagen and W. S. Wadleigh to take over the commercial light and power department of the Davis Milling Company. The new company is capitalized at $60,000.

THE HUGO (OKLA.) POWER COMPANY has been incorporated with a capital stock of $50,000 by R. D. Wilbor, W. A. Goforth and W. T. Larimore.

THE DENVER (IND.) ELECTRIC LIGHT & POWER COMPANY has been organized by A. C. Cunningham, Lee S. Long and Elvin R. Long. The company is capitalized at $10,000 and proposes to supply electricity for light and power purposes.

THE GULF COAST POWER COMPANY, Corpus Christi, Tex., has been incorporated with a capital stock of $100,000 by R. W. Marshall, Marshall Hicks and C. M. Dickson, all of San Antonio.

THE ATMOSPHERIC HEAT & POWER COMPANY, Biddeford, Me., has been organized with a capital stock of $1,000,000 to manufacture heating and power apparatus, etc. George B. Gordon, Biddeford, is president.

THE MARVEL LAMP COMPANY, Pittsburgh, Pa., has been incorporated under the laws of the State of Delaware by C. V. Brown and H. Nickum and Wallace H. Nickum, Pittsburgh. The company is capitalized at $50,000 to manufacture electric lamps and other electrical products. The Capital Trust Company, Dover, Del., represents the company.

THE TRIANGLE APPLIANCE MANUFACTURING COMPANY has been incorporated by M. H. Silverstein, Roy Silverman and G. Litka. The company is capitalized at $10,000 and proposes to manufacture electric toasters, curling irons, lamps and other electrical devices. Factory space has been secured at 160 North Wells Street, Chicago, Ill.

Record of Electrical Patents

Notes on United States Patents

(Issued Sept. 6, 1921)

1,390,201. ELECTRIC LIGHTING APPARATUS; John H. George, Bridgeport, Conn. App. filed March 16, 1918. Electric switch socket and lamp-focusing device.

1,390,250. X-RAY APPARATUS; Mathias B. Rodriguez, London, England. App. filed Sept. 18, 1919. Stereoscopic image of body under examination may be directly seen.

1,390,259. CONTROL FOR ELECTRIC MOTORS; Oscar F. Shepard, Cincinnati, Ohio. App. filed March 2, 1917. Magnetic rheostat type.

(Issued Sept. 13, 1921)

1,390,288. SYSTEM FOR CONTROLLING MOVING BODIES BY RADIO ENERGY; John Hays Hammond, Jr., Gloucester, Mass. App. filed July 24, 1913. Moving bodies at a distance by radio energy.

1,390,317. ELECTRICAL CURRENT-CONTROL DEVICE; Charles Wagner, New York, N. Y. App. filed March 25, 1920. Tattooing needle.

1,390,318. APPARATUS FOR REGULATING FREQUENCY; Henry E. Warren, Ashland, Mass. App. filed Sept. 29, 1916. For indicating the frequency of an alternating current.

1,390,319. SELF-STARTING SYNCHRONOUS MOTOR; Henry E. Warren, Ashland, Mass. App. filed Feb. 2, 1918. Starting into rotation at certain values of voltage and frequency and not at other values.

1,390,320. SELF-STARTING SYNCHRONOUS MOTOR; Henry E. Warren, Ashland, Mass. App. filed Feb. 2, 1918. Rotor having a starting member and a synchronizing member.

1,390,355. SEPARATOR FOR STORAGE BATTERIES AND METHOD OF MAKING; David F. Gould, Newark, N. J. App. filed Aug. 24, 1916. Method of treating sheets of wood.

1,390,369. TROLLEY-WIRE CLAMP; S. S. Mathes, Mansfield, Ohio. App. filed June 9, 1920. Will simultaneously grip conductor and supporting hanger.

1,390,394. FLOW METER; Jacob M. Spitzglass, Chicago, Ill. App. filed Oct. 25, 1917. Dangers incident to a surge in the differential pressure may be overcome.

1,390,407. ELECTRIC HEATING UNIT; Johann G. Wallmann, Oakland, Cal. App. filed Sept. 25, 1920. Useful in electric radiators.

1,390,409. AUTOMATIC TELEPHONE SWITCH; Harry G. Webster, Chicago, Ill. App. filed April 19, 1916. For extending connections from one line or trunk to another line or trunk.

1,390,429. ELECTRODE; Joseph S. Cape, Detroit, Mich. App. filed Nov. 5, 1919. For electro-therapeutic apparatus.

1,390,456. ELECTRIC-ARC LAMP WITH ROTARY ARC; Louis Mauclaire, André Garbarini and Georges Gautier, Paris, France. App. filed Oct. 23, 1917. Improvements in the construction.

1,390,468. RAIL-BOND PROTECTOR; Mark T. Stanton, Cleveland Heights, Ohio. App. filed May 31, 1917. Adapted to bonds attached to the heads of rails.

1,390,504. TRANSFORMATION OF POLYPHASE CURRENTS INTO PRACTICALLY CONSTANT DIRECT CURRENTS; Orso M. Corbino, Rome, Italy. App. filed Jan. 7, 1918. For transforming alternating current into practically constant direct current.

1,390,505. ELECTROLYTE; John Coulson, Wilkinsburg, Pa. App. filed Feb. 19, 1917. Lightning arresters, condensers and rectifiers.

1,390,515. CONTROLLER; Ralph Ehrenfeld and Niels Hansen, Wilkinsburg, Pa. App. filed Oct. 17, 1918. For electric motors of small horsepower.

1,390,524. ELECTRIC BATTERY; H. F. French and R. C. Benner, Fremont, Ohio. App. filed Jan. 27, 1917. To prevent electrochemical action prior to time cells are put into use.

1,390,526. ELEVATOR-CONTROL SYSTEM; Adolph A. Gazda, Pittsburgh, Pa. App. filed Jan. 5, 1918. For accelerating electric motors and for dynamic braking.

1,390,543. CURRENT REGULATOR; Frederick L. Re Qua, Milwaukee, Wis. App. filed Aug. 19, 1918. For current regulators for incandescent lamps.

1,390,545. DESK OPERATOR'S CIRCUITS; William A. Rhodes, New York, N. Y. App. filed Dec. 5, 1918. Testing equipment for operator's cord circuits.

1,390,575. ELECTROLYTIC CELL; Frederick H. Miller, Wilkinsburg, Pa. App. filed April 5, 1917. Condensers, lightning arresters, rectifiers, etc.

1,390,580. MEANS FOR REDUCING INTERFERENCE; Harold S. Osborne, New York, N. Y. App. filed Nov. 13, 1918. Signaling over ocean cables.

1,390,596. TERMINAL STRUCTURE AND METHOD OF MAKING THE SAME; Frank Thornton, Jr., Wilkinsburg, Pa. App. filed March 13, 1918. For use on electrical heating devices.

1,390,607. ELECTRIC CONTACT DEVICE; Clyde C. Farmer, Edgewood, Pa. App. filed Dec. 10, 1919. Electric train wire couplings.

1,390,624. SYSTEM OF ELECTRICAL SHIP PROPULSION; Benjamin G. Lamme, Pittsburgh, Pa. App. filed June 29, 1918. Efficient operation throughout wide variations in speed.

1,390,629. ELECTRODE PLATE FOR STORAGE BATTERIES; Lamar Lyndon, West Orange, N. J. App. filed April 30, 1919. For batteries of the Edison type.

1,390,646. ELECTRIC GAS GENERATOR; Rudolf Rosner, Chicago, Ill. App. filed Jan. 28, 1921. For generating a germicidal gas.

1,390,679. IMPULSE TRANSMITTER; Henry F. Dobbin and Edgar W. Gent, New York, N. Y. App. filed Nov. 21, 1918. Used in automatic telephone systems.

1,390,696. DRY CELL; Samuel E. Gertler, Brooklyn, N. Y. App. filed Nov. 20, 1919. Electrolyte will not form a double salt with zinc.

1,390,719. THERMO-ELECTRICAL APPARATUS FOR BOILING AND HEATING PURPOSES; Joaquin G. Lozano, Madrid, Spain. App. filed Jan. 8, 1920. Industrial or domestic.

1,390,727. SYSTEM OF TRANSFORMING DIRECT CURRENT INTO ALTERNATING CURRENT; Morris Schenkel, Charlottenburg, Germany. App. filed March 29, 1917. High-voltage direct current into single-phase or multi-phase alternating current.

1,390,729. AUTOMATIC TELEPHONE SYSTEM; Giuseppe Simonetta and Augusto Rosa, Milan, Italy. App. filed March 4, 1918. line searcher.

1,390,743. MEASURING DEVICE; Chester T. Allcutt, Wilkinsburg, Pa. App. filed Feb. 4, 1918. For determining when a predetermined current traverses a circuit.

1,390,765. GALVANIC BATTERY; Harold N. Cox, Glen Ridge, N. J. App. filed April 12, 1919. Negative electrode of oxide of copper and positive electrode of zinc.

1,390,779. ELECTRICAL APPARATUS HAVING WINDINGS; Joseph Goodman, Hayes, England. App. filed Nov. 20, 1917. Transformers, etc.

1,390,780. ELECTRIC RANGE SWITCH; Gilbert W. Goodridge, Bridgeport, Conn. App. filed Sept. 29, 1919. For controlling the connections for the heating elements of an electric range.

1,390,819. INSULATED ELECTRODE; Ray Van Sandt, Bakersfield, Cal. App. filed Dec. 29, 1919. For installation in tanks for use in oil-treating systems.

1,390,823. BURNING OF CARBON ELECTRODES; Sven E. Sieurin, Hoganas, Sweden. App. filed July 31, 1920. For producing carbon electrodes in an electric furnace.

1,390,843. REGULATING SYSTEM FOR DYNAMO-ELECTRIC MACHINES; Louis W. Thompson, Schenectady, N. Y. App. filed July 10, 1918. For varying excitation of an alternating-current dynamo as current varies.

1,390,883. RADIANT-ENERGY DETECTING AND TRANSLATING DEVICE; Theodore W. Case, Scipio, N. Y. App. filed April 5, 1918. For detecting light rays and translating the same into current variations measurable by instruments.

1,390,885. SAFETY TROLLEY; Owen L. Chesnutt, Atlanta, Ga. App. filed May 9, 1921. Susceptible of accommodating itself to lateral changes.

1,390,896. TELEPHONE-MOUTHPIECE DISINFECTANT; James Ferguson and William H. Bennett, Vancouver, B. C., Canada. App. filed Feb. 25, 1921. Easily applied and direct and lasting in its effect.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BOSTON, MASS.—Arrangements are being made by the Edison Electric Illuminating Company to proceed with the enlargement of its electric generating plant. The project includes the installation of a 30,000-kw. turbo-generator, boilers and auxiliary operating equipment. Charles L. Edgar is president.

MIDDLEBORO, MASS.—A recommendation contained in a report submitted by a special committee for the installation of electric pumps for the local pumping station was recently adopted at a town meeting. The cost of the outfit, which provides for a duplicate set of pumps for main service and for the filtration plant is estimated at $14,000.

NEW BEDFORD, MASS.—A portion of the power department of the New Bedford Cordage Company, Ash and Court Streets, was recently destroyed by fire. The department, it is understood, will be rebuilt.

WATERBURY, CONN.—Plans have been filed by the Plume & Atwood Company for the construction of a transformer station at its local works.

Middle Atlantic States

ALBANY, N. Y.—Tentative plans are under way by the Water Power Commission for the construction of a number of power plants on the Barge Canal. Development of a total capacity of about 40,000 hp. is contemplated, with distribution and sale in districts along the route.

BROOKLYN, N. Y.—Arrangements are being made by the Brooklyn Edison Company for an issue of $3,000,000 in bonds, the proceeds to be used for extensions, improvements, etc.

BUFFALO, N. Y.—Notice has been filed by the Niagara & Erie Power Company of an increase in capital stock from $300,000 to $900,000 for proposed expansion of its plants and system.

BUFFALO, N. Y.—Application has been made by the Niagara Gorge Power Company, an affiliated organization of the Niagara Gorge Railway Company, for permission to build a generating plant to utilize waters from the gorge section of Niagara Falls for the development of 300,000 hp.

FAIRPORT, N. Y.—A portion of the plant of the Douglas Packing Company, including five buildings, power equipment and general machinery, was recently destroyed by fire, causing a loss of about $1,000,000. John Clingen is general manager.

NEW YORK, N. Y.—Work will be started immediately by the Fulton Lumber Terminal Company, 120 West Forty-fourth Street, on the construction of a new plant on the Hackensack River, including planing mill, sash and door factory and other woodworking buildings, with cold-storage plant for foodstuffs. Conveying, general operating and power-plant equipment will be required. E. R. Eckles is president.

NEW YORK, N. Y.—Application has been made by the New York Edison Company to the Public Service Commission for permission to issue $30,000,000 in bonds, also permission for its subsidiary, the United Electric Light & Power Company to issue a similar amount. The proceeds are to be used for plant and system extensions, etc.

NIAGARA FALLS, N. Y.—Plans are under consideration by the Niagara Falls Felt & Paper Company, a subsidiary of the Niagara Falls Power Company, Canal Basin, for the installation of considerable electrical equipment in its proposed plant on Sugar Street, to cost about $300,000.

PRINCETOWN, N. Y.—The Adirondack Light & Power Corporation has been

authorized to construct an addition to its electric plant in Princetown and to exercise a franchise recently approved by the local authorities. E. J. West is vice-president of the company.

DOVER, N. J.—The New Jersey Power & Light Company of Dover is negotiating for the purchase of the Woodburne Light, Heat & Power Company. The Dover company, it is understood, plans to furnish electricity for light and power to Newton and Hamburg in Sussex County and a number of municipalities and industries in Morris County.

MONTCLAIR, N. J.—Negotiations are under way between the Chamber of Commerce and the Town Commissioners for the installation of an ornamental lighting system on Bloomfield Avenue.

NEWARK, N. J.—Plans have been prepared by the General Leather Company, 420 Frelinghuysen Avenue, for the construction of a new one-story power house.

NEWARK, N. J.—Arrangements have been made by the Public Service Railway Company, Terminal Building, for an issue of $1,540,000 in certificates, the proceeds to be used for extensions, improvements, electrical equipment, etc.

VENTNOR CITY, N. J.—Negotiations are under way between the City Council and the Atlantic City (N. J.) Electric Company for the installation of a new lighting system in Ventnor City. The present plans provide for replacing the arc lamps on the boardwalk, Atlantic, Ventnor and Winchester Avenues with incandescent lamps. Ralph Brooks is chairman of the lighting committee of the Council.

ARDMORE, PA.—Notice has been filed by the Counties Gas & Electric Company, of an issue of $6,120,000 in stock, the proceeds to be used for extensions, improvements, etc.

BRADFORD, PA.—Arrangements have been made by the Bradford Electric Company for an issue of $50,400 in bonds, the proceeds to be used for general extensions, improvements, etc.

KELLETTVILLE, PA.—The Salmon Creek Lumber Company is contemplating rebuilding its sawmill, power house and other buildings, recently destroyed by fire, causing a loss of about $100,000, including machinery.

PHILADELPHIA, PA.—The Quartermaster Department of the government, Intermediate Depot, is contemplating the construction of a power house at its local property.

PITTSBURGH, PA.—Notice has been filed by the Beaver County Light Company of an issue of $130,000 in bonds, the proceeds to be used for extensions, improvements, etc.

BALTIMORE, MD.—Arrangements have been made by the Consolidated Gas, Electric Light & Power Company for an issue of $9,000,000 in bonds, the proceeds to be used for plant expansion, improvements, etc.

NORTH EAST, MD.—J. W. Archer & Son are contemplating the installation of new equipment in the power house at their canning plant, to replace equipment recently destroyed by fire.

SOUTH CHARLESTON, W. VA.—Bids will be received at the office of the Chief of the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 26, for the construction of an electric cable system at South Charleston, W. Va. For further information address as above.

LURAY, VA.—Plans are under way by the Luray Ice Company for the construction of anew power plant. E. C. Harnsberher is president.

PETERSBURG, VA.—Work has been started by the Virginia Railway & Power Company on a small dam in the Appomattox River at Petersburg, in connection with a hydro-electric plant to be built at a cost of about $100,000.

North Central States

MANISTEE, MICH.—Ruggles & Rademaker, 381 River Street, have work under way on the construction of their new salt plant, to cost about $1,000,000, including machinery. A power house, machine shop and other buildings will be erected in connection with the proposed plant. F. W. Perkins, care of the company, is architect and engineer.

PETOSKEY, Mich.—The City Council is considering enlarging and improving the municipal lighting plant.

EATON, OHIO.—The Liberty Light & Power Company, Richmond, Ind., has been authorized to erect and operate electric transmission lines in Campbellstown and Jackson and Jefferson Townships, Ohio.

LIMA, OHIO.—The City Council has authorized the installation of an ornamental lighting system on West Market, West High and West North Streets.

BOWLING GREEN, KY.—The Lost River Cave Company, recently organized, is contemplating early construction of a hydro-electric power plant in the vicinity of Bowling Green. Henry L. Underwood is president.

HELLIER, KY.—The Columbus-Edewater Coal Company, recently organized, is planning the installation of power equipment for the operation of mines. The cost of the plant is estimated at $25,000.

JACKSON, KY.—Improvements are contemplated by the Jackson Light & Power Company. Machinery will be required.

LEXINGTON, KY.—The Dix River Power Company, recently organized with a capital stock of $10,000,000 by Lewis Herrington and others, is contemplating the construction of a 30,000-hp. plant on the Dix River. Electricity will be supplied to Louisville, Lexington, Frankfort, Danville, Harrodsburg and other cities in central Kentucky. The cost of the project is estimated at between $3,500,000 and $4,000,000.

WHITESBURK, KY.—The J. C. Burton Coal Company, Matoaka, W. Va., has acquired the plant of the Caudill Coal Company, Whitesburg, Ky., and is planning the installation of power equipment at the property.

KINGMAN, IND.—Plans are under consideration for the establishment of a lighting plant in Kingman, to cost about $18,582. J. M. Lewis is interested.

BARRINGTON, ILL.—The local power plant of the Public Service Company of Northern Illinois was recently destroyed by fire, causing a loss of about $200,000.

CENTRALIA, ILL.—The installation of an ornamental lighting system in Centralia, to cost about $39,533, is contemplated. The present plans provide for a rubber-insulated system and single-lamp, cast-iron standards.

CHILLICOTHE, ILL.—The sum of $4,000 has been obtained for the installation of an ornamental lighting system in Chillicothe. M. C. Kelly is chairman of the Light Commission.

SPRINGFIELD, ILL.—The Central Illinois Public Service Company has petitioned the Illinois Public Utilities Commission for permission to issue $450,000 of refunding mortgage bonds and $142,000 general mortgage bonds.

MANITOWOC, WIS.—The Brewer Manufacturing Company, manufacturer of piano benches, optical office supplies, etc., is planning the construction of a factory and power plant, 60 ft. x 120 ft., to cost about $40,000.

OSKALOOSA, IOWA.—Plans are under consideration for the construction of a hydro-electric plant on the Des Moines River southwest of Oskaloosa. The project includes a dam to provide for the development of 4,000 hp. T. H. Carlin is clerk.

LIBERTY, MO.—The installation of electric pumps at the water-works to replace those now in use has been recommended by City Engineer Barnes.

FAULKTON, S. D.—Bonds have been voted for the establishment of a municipal lighting plant in Faulkton.

NEBRASKA CITY, NEB.—A transmission line, it is understood, will be erected from Nebraska City to Dunbar to supply the latter place with electricity for light and power.

NORTH PLATTE, NEB.—Bonds have been voted in Brady, Maxwell, Hershey, Sutherland and Paxton for the joint erection of a transmission line from North Platte to the respective villages.

DOWNS, KANS.—The local plant of the United Light & Power Company, it is reported, was recently destroyed by fire, causing a loss of about $100,000. The plant, it is understood, will be rebuilt.

Southern States

GASTONIA, N. C.—The Council is considering issuing $500,000 in bonds for extensions to the electric light and water-works system.

PILOT MOUNTAIN, N. C.—At an election to be held on Oct. 25, the proposal to issue $50,000 in bonds for the installation of a hydro-electric plant on Ararat River will be submitted to the voters.

WESTFIELD, N. C.—R. T. Joyce of Greensboro is planning the installation of machinery at his power house and dam and the erection of a transmission line. Mr. Joyce, it is understood, is asking prices on a 100-hp. dynamo, 30-in. vertical wheel and 15,600 lb. No. 4 copper wire.

MARION, S. C.—The proposal to issue $100,000 in bonds for the installation of a lighting system, etc., is under consideration by the City Council.

CEDARTOWN, GA.—Extensions to the municipal light, water and sewer systems and other city improvements, to cost about $160,000, are under consideration by the Council.

FORT PIERCE, FLA.—The city authorities are planning an addition to the municipal light and water plant to provide for an increase in capacity to 450 kw. Equipment, including a 400-hp. oil-burning Diesel engine, 350-kva. generator and 500-gal. service pump, will be installed. The cost is estimated at $55,000.

PIGGOTT, ARK.—The installation of electric lighting and water systems in Piggott is under consideration by the City Council.

PLAIN DEALING, LA.—The Plain Dealing Light & Power Company contemplates the establishment of a power plant. M. S. Bolinger is president.

BROWNSVILLE, TEX.—Bids will be received Oct. 20 for furnishing one 500-kw. to 700-kw. turbo-generator to be intalled at the municipal electric plant. George Grupe is City Manager.

CAMERON, TEX.—The City Council is considering the proposal to issue $250,000 for the establishment of electric light, water and sewage disposal plants. The Engineering Service Company, Sumpter Building, Dallas, is consulting engineer.

Pacific and Mountain States

SEATTLE, WASH.—Bids will be received at the U. S. Engineer Office, Seattle, Wash., until Oct. 22, for constructing emergency dams for Lake Washington ship canal locks, Seattle, Wash. The specifications include operating mechanisms, switchboards, motors, controllers, electrical equipment, shafts, gears, wire rope, etc. Information may be obtained on application to the U. S. Engineer Office, Seattle, Wash., Chicago, Ill., or Pittsburgh, Pa.

LOS ANGELES, CAL.—Arrangements have been made by the Los Angeles Gas & Electric Corporation for an issue of $1,500,000 in bonds, the proceeds of which will be used for extensions, improvements, etc.

SAN FRANCISCO, CAL.—The Coast Valleys Gas & Electric Company has petitioned the railroad Commission for authority to issue stock to the amount of $100,000, the proceeds to be used for additions and improvements to its plants and equipment.

SAN FRANCISCO, CAL.—Plans are being prepared by the Pacific Gas & Electric Company for the construction of a substation on Lake Kemescal, Claremont, to cost $20,000; substation at Fiftieth Avenue, Oakland, Cal., $20,000, and a substation at Newark, $20,000.

SALT LAKE CITY, UTAH.—William Schuyler Post of Los Angeles has filed application with I. E. Caldwell, state engineer, for permission to appropriate 8,000 sec.ft from Green River, 1 mile below Minnie Maud Creek, to develop 500,000 hp for municipal use and for electrification of railways, and 1,500,000 acre-ft. for storage. The project includes a dam 150 ft. high, reservoir, canal 90 ft. wide at top and 50 ft. at bottom, and the installation of twelve 5,000-hp. turbines.

MALAD CITY, IDAHO.—The Evans Light Company contemplates the installation of additional transformers and larger conductors.

ST. ANTHONY, IDAHO.—At a meeting of the city authorities of Rexburg, St. Anthony, Idaho Falls and Ashton, held recently, committees were appointed to investigate sites and consider other details in connection with the feasibility of establishing a joint municipal power plant to serve the communities which are named above.